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The Oldest American Aeronautical Magazine

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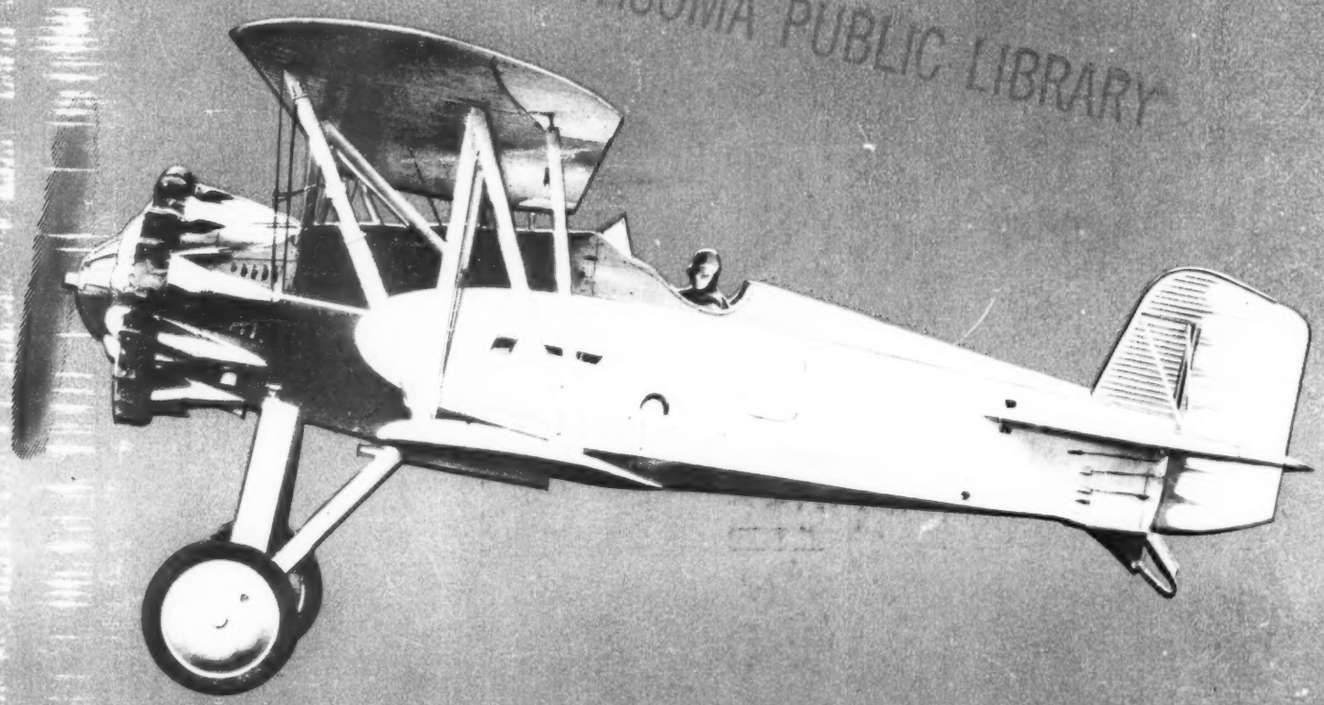

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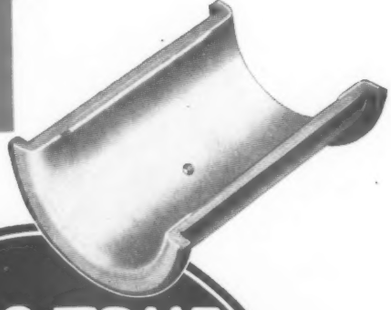

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AVIATION

The Oldest American Aeronautical Magazine

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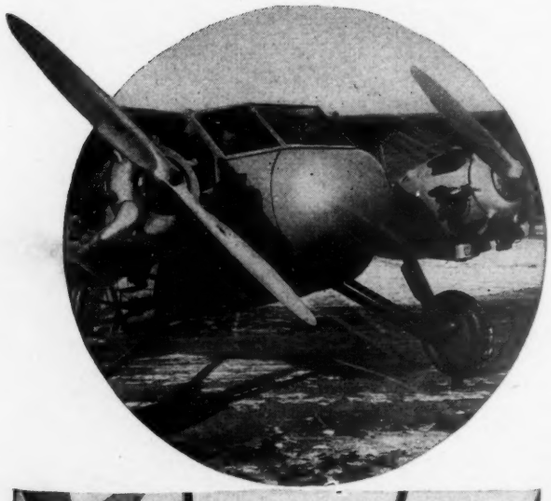
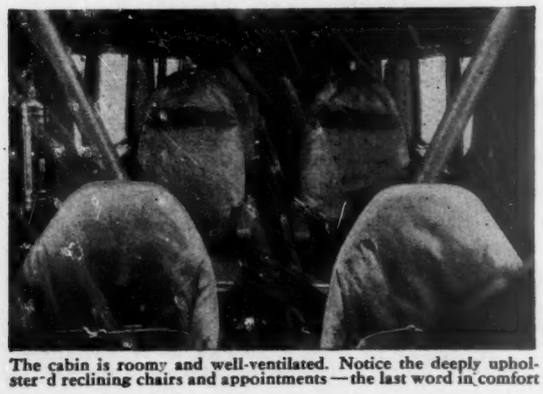


Interior of pilots' compartment. Note the unobstructed vision, efficient arrangement of controls, and completeness of instrument board



The cabin is roomy and well-ventilated. Notice the deeply upholstered reclining chairs and appointments — the last word in comfort

MUCH has been said and written concerning the ability of multi-motored planes to climb on the take-off, fully loaded, with one engine cut out. Curtiss-Wright announces its readiness to demonstrate to the satisfaction of any operator or pilot that the new twin-motored 8-place Kingbird *can be relied upon* to accomplish this feat.

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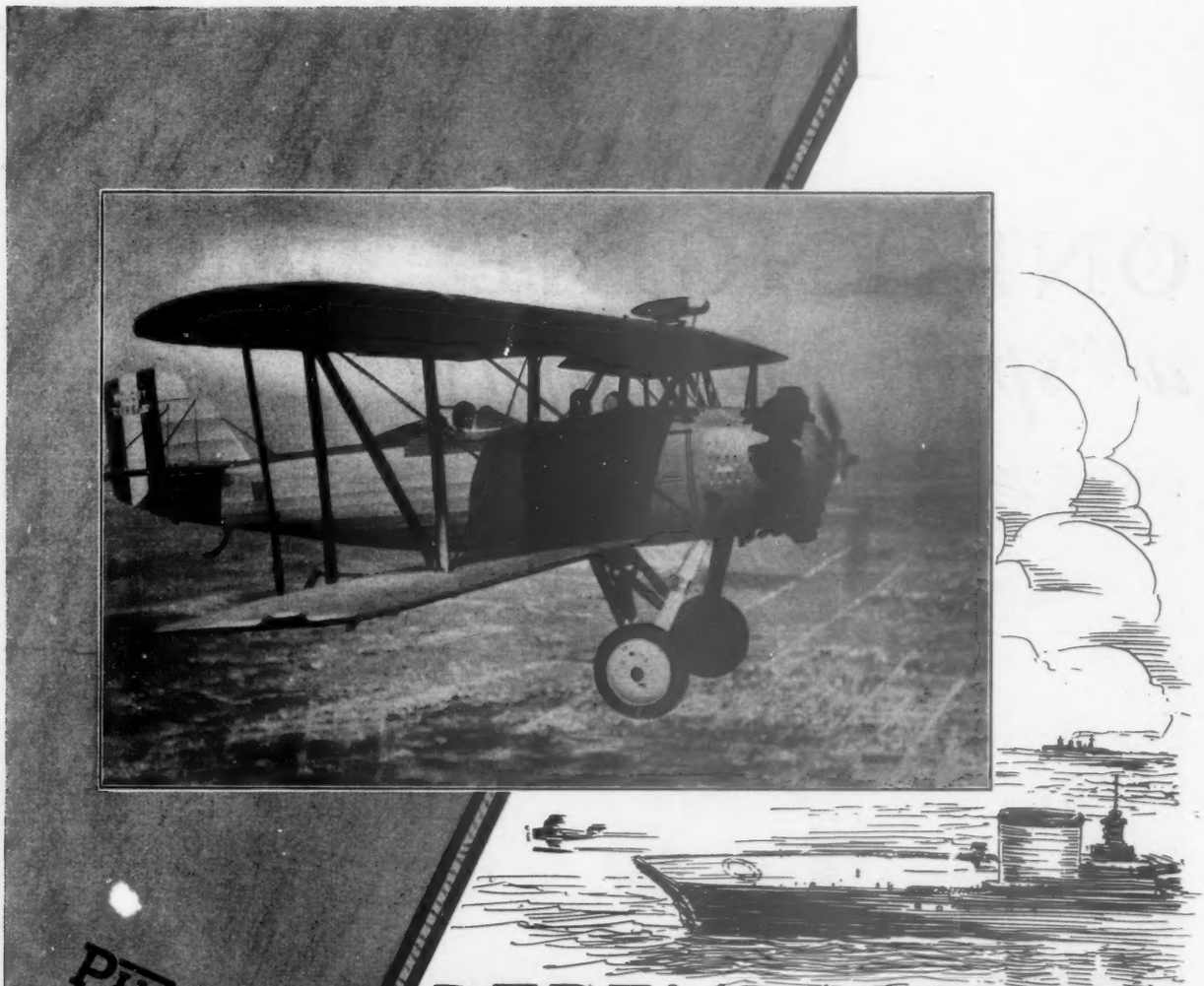

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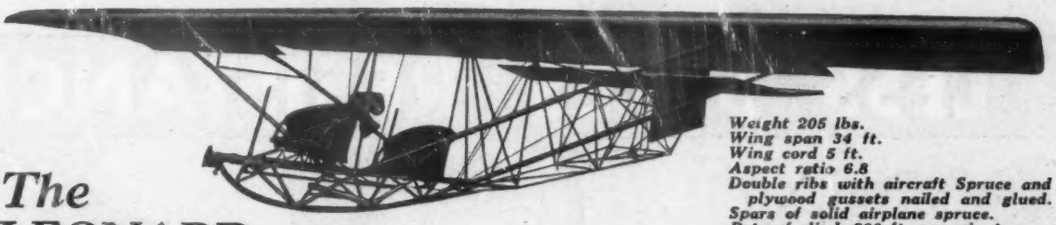

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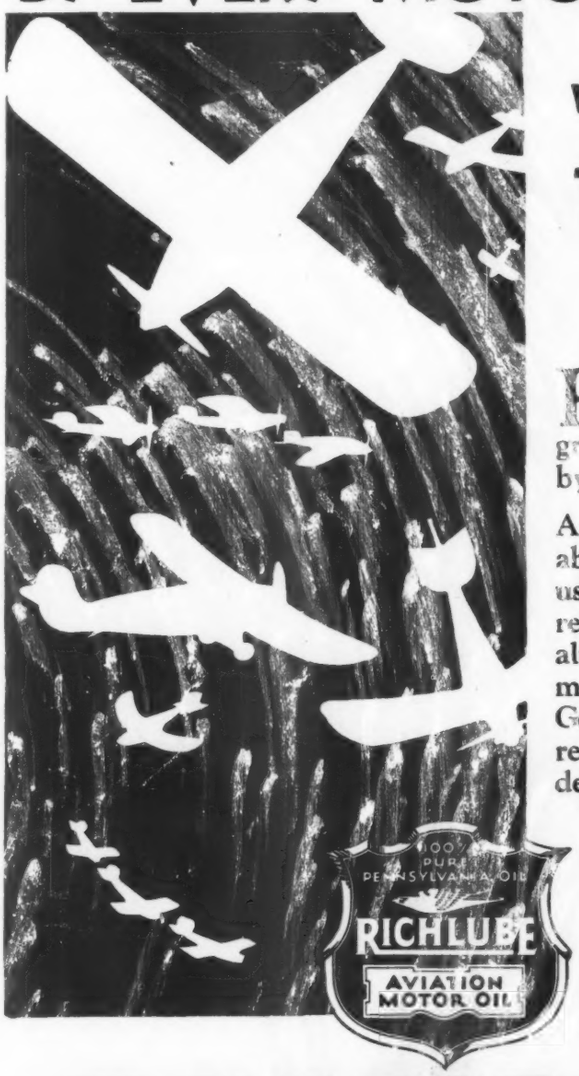

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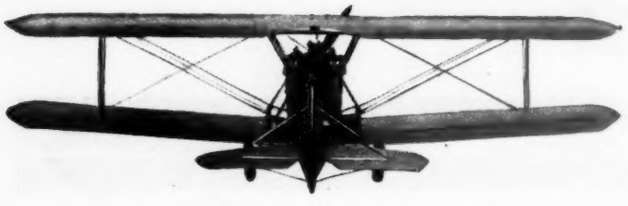

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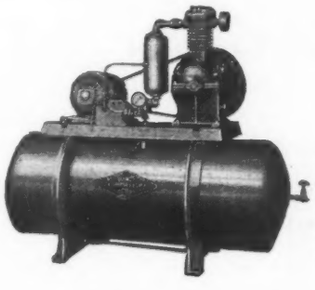

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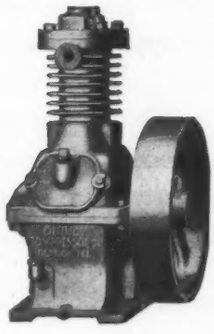

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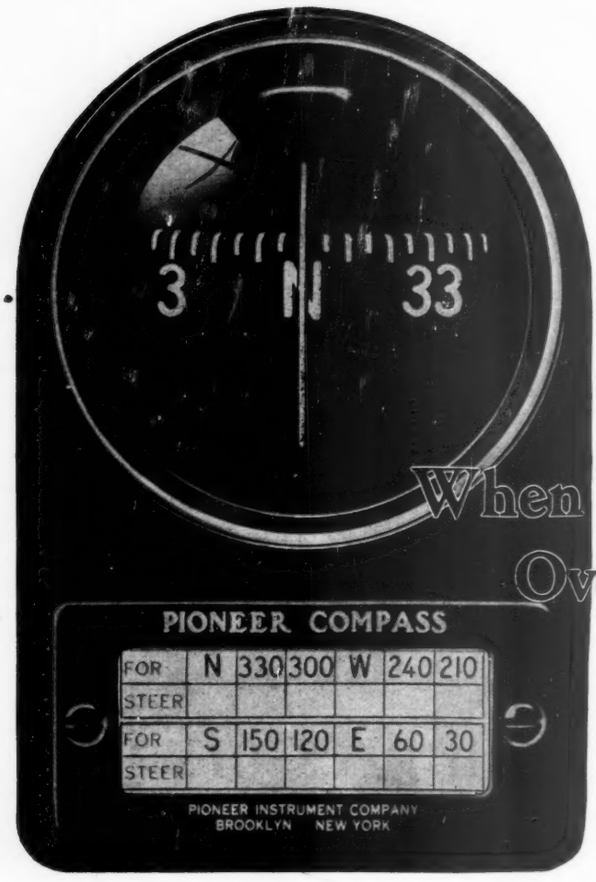

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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A McGRAW-HILL PUBLICATION . . . ESTABLISHED 1916

EDWARD P. WARNER, *Editor*

VOLUME 29 . . . *July 5, 1930* . . . NUMBER 1

Off With the Old, On With the New

THIS is the last issue of AVIATION that will appear in the present form. Next week will mark the introduction to the public of THE AVIATION NEWS. Three weeks hence the next copy of AVIATION, changed and enlarged, yet familiar, will reach the hands of its subscribers. Thereafter it will be with you monthly.

This is in no sense, therefore, a leave-taking. We bow our appreciation and disappear behind the curtain for only a moment, to emerge again in a slightly changed costume but in the same character.

We speak of expressing our appreciation. In the two weeks since the first announcement of this prospective change was made we have had much to appreciate. We take this opportunity of making collective acknowledgment to our friends, who have been almost unanimous in their approval of the change and almost unanimous in understanding, and accepting the validity of, the reasons that lead us to make it.

It is futile to blink the fact that the aviation industry has many serious problems. We have never shirked recognizing it, and we shall not begin to do so now. In solving those problems, two things are vitally needed.

First is courage. We have no time to sit about with our heads sunk in our hands. We need to go forth with our chins held high, looking the world in the eye with confidence that what we have to say is worth listening to. We need courage, but not mere encouragement. It wants to be the kind of courage that comes from within. Persuasive backpatting, and assurances that everything is lovely, and that the modern airplane is the most marvelous vehicle ever designed, and that the aviation industry is doing everything that can be done to market its products, are worse than silly.

The second thing needed is information. As a matter of fact, the first and the second merge. Children are afraid in the dark because they cannot see what is happening. An industry lacking fundamental information about its own operations and its own public is a timid and a down-hearted industry, and for precisely the same reason.

Information is needed in two senses, and both are within our function. First, there is current news. THE AVIATION NEWS will be devoted to that. Second, there is the general perspective of what is going on. The word "survey" has been used so much and become so hackneyed that we hesitate to employ it, but we are not going to hesitate at all in carrying on the kind of investigation to which that term is commonly applied. We carry in this issue a study of the experience and past activities of a group chosen at random from among licensed pilots and holders of student permits. We are working now upon an examination of glider developments here and abroad and upon flying club activities.

Occasionally we hear of statistical and market researches undertaken by individual companies. When the outlook is confined to a single type of aircraft or accessory, it is of course natural that the work be undertaken by the company most interested. When the field is broader than that, we mark ourselves down either as having incompletely met our own ideal of our own task or as having failed to bring our own activities sufficiently to the attention of the industry. We have set out to keep our readers fully informed of what is going on. We have tried, and in the future, working under more favorable conditions than in the past, we are going to continue to try, to do that well enough so that manufacturers and distributors will not have to repeat our investigations for themselves.

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Standardized Performance Tests

THE QUESTION of performance measurement will not down. Some of the large manufacturing groups are taking it very seriously now, but it cannot be disposed of by any such measure as the establishment of a performance-testing section within a company's own organization. Before our statements of speed and climb will receive full credence from the cynical they must be certified from impartial sources, sources of which the competence and the integrity are alike above all question.

The rôle is one for the Department of Commerce. It fits in naturally with their other activities. Performance, especially in respect of climb and take-off, is an essential factor determining safety, and should be attested by the body that issues licenses with safety in view.

However, the Department is at present unable or unwilling to undertake the rôle. We hope the conditions will change and that Secretary Young will keep the matter continuously in mind, but for the moment we must cast about for other expedients.

One, obviously attractive, is again for the third or fourth time being pressed upon Congress by high officials of the Air Corps. At Wright Field there is a plant without a peer. There is a staff for which performance testing is the daily task and which has had every opportunity of gaining intimate acquaintance with all the flaws that can insinuate themselves into such measurements. They have every qualification to test commercial planes. All that they want is the authority of Congress to do the work and charge a reasonable fee for it, followed by a display of the industry's willingness to take impartial tests and to pay what it costs to make them.

Wright Field cannot serve the entire country, and without some interest on the part of Congress it can do almost nothing. Thus we are thrown back on the private individual, or private or commercial institution.

There are individuals in the United States whose name signed to any performance test would be, to anyone who knows the industry and its personnel, unquestionable guarantee of the fairness and accuracy of the results. Given a reasonable evidence of the industry's desire to have performance data and to pay for them, services will be established to take a place, and build up a reputation, comparable to those held in their several fields by a number of well-known mechanical and testing laboratories. One or two attempts to inaugurate such services have already been made. Lamentably, they have failed for lack of support.

But now there is a new scheme. Under the ægis of the Aeronautical Chamber of Commerce, performances are to be certified by universities. We await the issue with interest. It may work, or it may not. The inherent probabilities of the case are all against it.

The name of "university" has an impressive sound, but those who have seen academic life from the inside know that universities are like other institutions. There are good ones and bad. There are faculties of every sort of specialized attainment. There are professors of aeronautical engineering in the United States whose qualifications to do performance testing are beyond impeachment. There are others who, if only because of lack of experience or because their special interests have lain in other fields, are quite incompetent. There are faculty members whose word on any matter on which they are willing to express an opinion deserves to be taken as final evidence. There are others who, judged as individuals, would find the soundness of their views and the accuracy of their determinations of physical fact at least suspect.

Under this new plan, except for a somewhat indeterminate system of controlling the universities participating, there will be no separation of the sheep from the goats. Performance testing will not stand on the authority of an individual of known qualifications, nor upon that of a particular institution of established reputation, but upon the fact of approval by some university—any university that has been sanctioned by a more or less remote committee, the members of which have plenty of business of their own to occupy their time. We shall continue to exercise our own freedom of judgment upon the validity of the various results so obtained.

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Stop Watch and Slide Rule

A FEW MONTHS AGO a new speed record was made. It was reported to the newspapers, and accepted by them at 185.452822 m.p.h. Fantastic as that string of digits is, it is typical of many that have found their way into the press, and even into the record books. There is no known means of timing or measuring a record that would give even one one-hundredth part of the accuracy implied in such figures. The methods commonly used show a probable error something like a hundred times as large again. How long must aeronautical sport, supposedly controlled from a scientific point of view, be made thus ridiculous in the eyes of every intelligent engineer?

The record quoted was strung out to a millionth of a mile an hour. To attain that accuracy the thirty-one mile course around which record trials are made would have to be laid off with an error in length with less than one-sixty-fourth of an inch. The time of a one-hundred-kilometer flight, twice around such a course, would need to be measured accurately within one-fifty-thousandth of a second. As already suggested, to reduce the error to one hundred times that magnitude would require laboratory precision of the highest order. An error of five feet in laying off a thirty-mile course, or

of a twentieth of a second in timing (and there is plenty of evidence that few timers, even with the best of manually-operated apparatus, are reliable within that range) would change the last four figures in the record that had been so solemnly certified.

The failure to take adequate account of the inevitable human error in measurement, and to limit statement of records to a reasonable number of significant figures, is not the only absurdity in the present method of certification, but it is the most ridiculous. The technical regulations of the F.A.I. have grown up through many years, and some of them have been based more on convenience or on specious and unscientific attractiveness than on logic. In the application of good sense to our record making, in fact, we in aeronautics, who live surrounded by engineers if we are not engineers ourselves, have something to learn from the bodies governing track athletics. We should like to see an American committee, a committee of real experts, undertake a general and basic reconsideration of the technical rules in the near future, unshackled by any thought of precedent. We should then have something worth laying on the table of the F.A.I. as our national recommendation. Patchwork improvement of such rules will never catch up with scientific development.

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President Rubio Speaks Out

TO THE SOUTH of the United States there lies a country where they intend to keep aviation out of gold lace and in overalls. With a coolness of judgment which might well be accepted as a pattern elsewhere, the distinguished president of the Mexican Republic, while applauding the spectacular achievement of Col. Roberto Fierro, has made it plain that for the present at least it must be the last of its kind.

His words, strongly reminiscent in tone of some more picturesque phrases recently employed by Mr. E. P. Halliburton, are too sensible to pass unnoticed. Mexico, said the President, needed its own aviators and their services. Long-distance flights endangered the lives of the pilots without sufficient return, brought no direct benefit to the country, and would be prohibited.

There can be no universal rule in such matters. In the face of our unfavorable opinion of ocean flights as typically undertaken we are glad to express our delight and relief at the success of Captain Kingsford-Smith's attempt to cross the Atlantic, and to pay deserved tribute to certain features of the technical organization of his flight. The quality of the navigation, and the exceptional consistency of the radio communication, evoke special admiration. So does the generous and modest demeanour of the commanding officer, already renowned for one of the greatest aerial ventures in history, and his associates. None the less, although the spectacular and daring achievement stirs the blood, in principle we accord in the sober judgment of President Rubio. Aviation has passed the point where it needs the spectacular. Nothing has happened in the last year to shake our confidence, expressed at the time of the Cleveland races, that stunting hurts the airplane. We look with great scepticism on exhibitions of any kind. They have outlived their time. The airplane has settled down to work. As a working vehicle the traveling public is accepting it. Let its vaudeville days be slipped into oblivion.

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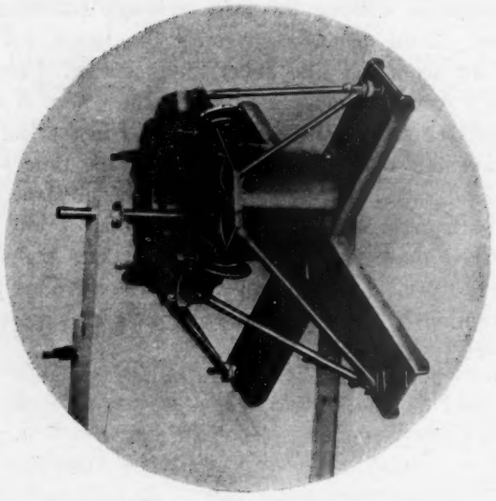
Take a Plane Abroad

GO DOWN by the docks in the Hudson River on almost any day of the next month, and you will see automobiles being loaded, Europe-bound. The tourist season is in swing again. In the past ten years, thanks to publicity by the steamship companies, it has become the touring season in fact, with a large proportion of the travelers furnishing their individual transportation. Those who have done Europe by highway once are likely to return and do it again, but why so much monotony? Why not at least make the second trip, if not the first one, by air?

Thanks to the efforts of European aero clubs, it is as easy to travel internationally by air as by highway. It may be even a little easier, for the airplanes land only at large customs airports where everyone is familiar with the procedure, whereas motor cars may cross international boundaries on little frequented highways. The cost of preparing for a European tour is reasonable, and the trouble involved is slight. If we could find some way of making ourselves a party to the International Air Navigation Convention, it would be simpler still. The Royal Aero Club made arrangements during the last year for 252 British private pilots to fly on the Continent. At least one steamship company has made special arrangements for handling private airplanes with a minimum of formality and of preliminary packing, very much as they handle automobiles. Yet the total number of American travelers who have flown their own planes abroad has been but half a dozen, and all but one or two of them have been on aeronautical business bent.

The British aircraft industry labors under many handicaps, but in at least one respect it has led the world. It has made genuine aerial touring, private ownership of the purest sort, a compelling force. Of the three hundred thousand Americans who will be crossing the Atlantic this year there ought to be at least fifty to take their own planes with them and fly themselves from place to place. Fifty now would be the forerunner of five hundred three years hence. This is a call for pioneers.



Rotatable engine mounting jig used by the Consolidated Aircraft Corp.

Welding Jigs AND FIXTURES

By J. F. HARDECKER

A Discussion of the Current Representative Factories in of This Type of Production

A GREAT DEAL of attention has naturally been centered on the preparation of material for welding, training of welders, torch manipulation and all that goes into the actual weld, while comparatively little has been said about the work of the real power behind the throne of welding supremacy—the welding jig.

Cursory consideration of welding jigs naturally reveals their obvious advantages as an adjunct to quantity production. Not only do they speed up the actual operation of welding, but they also permit the cutting of component tubes to exact length in quantity, doing away with the necessity of cutting each piece to fit on the individual job. This manifestly leads to an interchangeability of fabricated units which is so clearly desirable that its advantages may be taken for granted. Of even greater advantage is the accuracy of alignment obtainable, which is so essential in airplane construction, and the control of shrinkage and warpage.

The simplest welding jig which will answer the purpose is the best. Great sturdiness, adjustability and ease of operation are highly desirable features. Boiler plate and relatively heavy structural shapes, often electric welded, are most desirable for jig materials, although wood is occasionally used for experimental models. Adjustability is usually attained by some variable feature in the clamps that hold the parts to be welded in place. Many jigs are adjustable for position with respect to the welder (rotating type), allowing the operator to work in a comfortable position, thereby greatly increasing the probability of good welding, not to mention the increase in speed of welding, since the entire assembly can be welded without removing it from the jig.

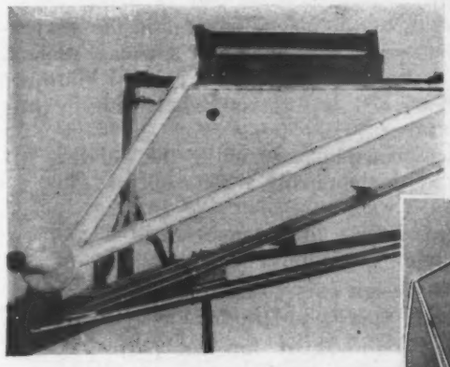
Welding jigs can best be designed by actual practice. The jig for each individual structure is a problem in itself. Avoidance of initial stresses introduced in the structure by shrinkage is very important in design. Allowance for shrinkage varies with the type and amount of welding of the particular joint. It is impossible to set down a concrete rule, however, a close approximation for shrinkage of small structures (training type) is $\frac{1}{32}$ in. for each joint. This is, of course, for the welding of the joint itself after all detail fittings are welded in place.

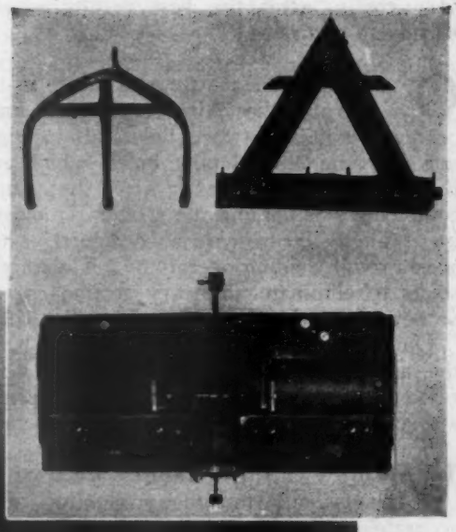
In using a welding jig, the proper progression of welding is extremely important, in order to balance the shrinkage stresses and prevent warping. It must also be kept in mind that steel, in cooling, passes through temperature ranges in which it is comparatively weak and brittle. Therefore, if one end of a piece is welded, and before this end cools, the other end is welded, the contraction still taking place in the original weld may cause cracks in the second weld before it has cooled down to its full strength at ordinary temperatures.

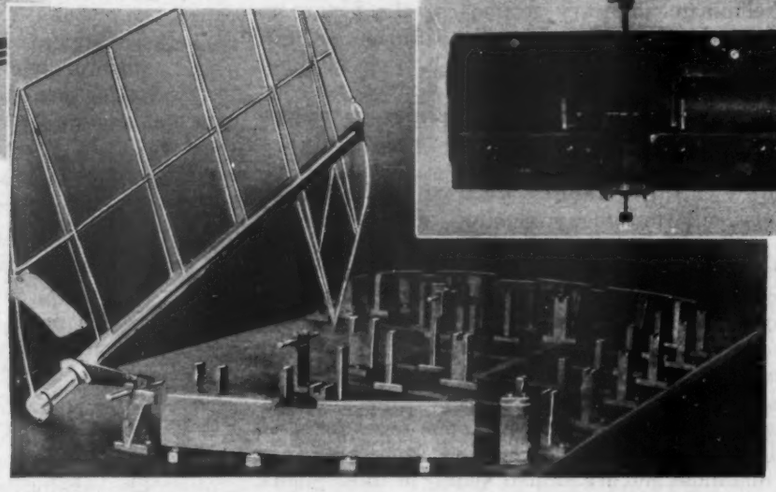
In considering the detail design of various welding jigs for specific airplane units as evolved by different airplane manufacturers, an immediate difficulty presents itself in the matter of classification best suited for comparative purposes. It is believed this can best be overcome by first presenting a general classification, based on the practice of several representative airplane manufacturers, followed by detailed consideration under the general classifications of the plane itself, such as fuselages, tail surfaces, wing spars, etc.

THE WELDING JIGS used by the Fokker Aircraft Corp. may be divided into four groups, in accordance with the type of structures for which they are designed.

1. Fixtures for structural tubular frames assembled with a close tolerance of say plus or minus $\frac{1}{16}$ in. allowance in overall dimensions. For structures built in one plane such as fuselage sides and plane bulkheads, a combination of units composed of common structural-steel angles joined by welding and braced by semi-circles of steel plate nibbled as shown in Fig. I, is used. The tubes of the structure which is being welded rest on the angles which are cut away at the point of welding. This gives a better welding position than if the tubes were resting on "V" blocks. For structures which are built up in two or three planes, such as engine nacelles,







Left: Landing gear jig in use at the factory of the Travel Air Co.

Right: Jigs of the Bach Aircraft Co.

A stabilizer jig used in the construction of the Stearman C-4A

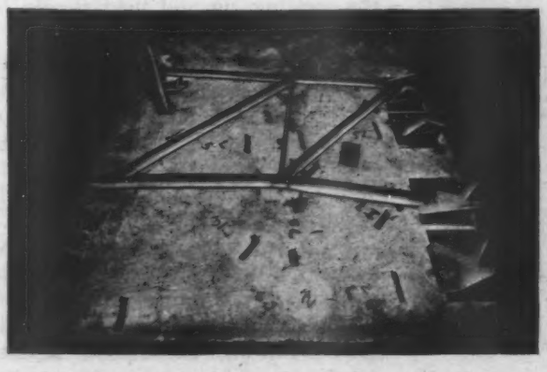
Practices of the Design Equipment

a modified construction is used, the fixtures being steel built of angle iron as shown in Fig. II.

2. Fixtures for welding main fittings to tubular construction such as welding wing attachments, landing-gear attachments, engine mounts, etc., to the fuselage or hinge-pin lugs to tail surface frames. Tolerance for these attachment fittings, center to center, is plus or minus $\frac{1}{64}$ in. and sometimes less for the small parts. For this purpose, the fitting brackets are bolted on the jig so as to enable the assembling of the fixture to be done to the close tolerances required.

3. Welding auxiliary fittings to the main structures with plus or minus $\frac{1}{32}$ in. limits. Under this class fall lugs for window frames, fairing strip lugs, etc. The jigs for this purpose are the ordinary type of locating fixtures made of structural steel or tubing.

4. Fixtures or jigs for the assembly of small welded parts. The assembly fixture is made of cold-rolled steel, care being taken in its design for high-quantity production and low cost.



Keystone-Loening Commuter center section strut welding jig

Dependence for keeping the work within proper dimensions is not put on the welding jig alone. The parts are made to dimensions, so that they will fit properly and avoid big gaps which require heavy welds and introduce uncontrollable shrinkage. All tubes for structural and non-structural parts are finished on the milling machine.

IN THE DEVELOPMENT of welding jigs the Bach Aircraft Co. follows two general methods differing considerably in both procedure and results obtained.

The first problem to confront this organization lay in the universal one of jigs that could be built at not too great a cost and still give good results. The basis of the solution was extreme accuracy in flat layout and bending blocks. This was accomplished by two master patterns—one which contained all the holes for accurate drilling and the others which contained pins for holding while nibbling. Now, these holes, which are accurately drilled, are used for locating on the bending blocks, the result being that in the end all the component parts of a fitting are accurate and complete in every respect. In many cases all that is required for a welding jig is a simple device for holding the component parts in place while welding. In many cases pins are the only jigs used.

The second type of jig is of a more conventional nature, with the component parts undrilled except for one master hole and held in place on an elaborate welding jig.

After welding, another equally elaborate drilling jig is used for drilling all holes. This method, although

very costly, gives the best results where appreciable shrinkage occurs.

ON SMALL welded fittings, as used in the production of Great Lakes Aircraft Corp., requiring accurate center distances between holes, all locating is done by means of undersized pilot holes, which are drilled and reamed full size in the jig after the assembly has been completely welded and the strains removed by normalizing. These fixtures are so designed as to allow ready access to all welding operations. They are also designed so as to eliminate all heavy sections of the fixture at or near the weld, thus minimizing the diffusion of heat.

Quick clamping methods are used, bearing in mind the assembly of the details into the fixture and the removal of the welded assemblies. Springs on clamps are seldom used due to their being affected by heat.

WELDING JIGS and fixtures are used at the Curtiss plants to insure the production of uniform and accurate parts and assemblies by labor of average skill and in the shortest possible time. The use and design of jigs and fixtures is largely influenced by the type and number of airplanes being built. For example, the jig for a welded fuselage skeleton for an experimental model on a lot of three to four planes, is usually a wooden scaffolding. This scaffolding is bolted together and is made of heavy stock to insure the necessary and desired rigidity. Pillow blocks, holding clamps, etc., are kept to a minimum and are located mainly at those points where major attaching parts join the fuselage. The design of the jig is such that dis-assembly of a minimum number of its members will permit removal of the finished product.

Fuselage jigs for a greater number of planes, say ten to twenty-five, are usually welded-up structural steel of rigid construction, although the use of the built-up structural-steel type bolted together, is of common occurrence. To permit the greatest number of men to work on a fuselage at one time, the jig is often made in sections, and when expedient, the "sectional" jigs are designed to revolve about a horizontal axis. The finished products of these jigs are then joined in an assembly jig to complete the unit.

Jigs for fittings vary in type considerably, depending on the quantity of fittings to be produced. Where a jig or fixture is necessary but the quantity of fittings to be produced is small, the jig is a temporary affair and may be a welded- or built-up type. For quantity production the jig is often a casting, substantial enough to resist distortion caused by welding the fitting, and frequently designed to be used as a machining fixture after the welding operations are complete.

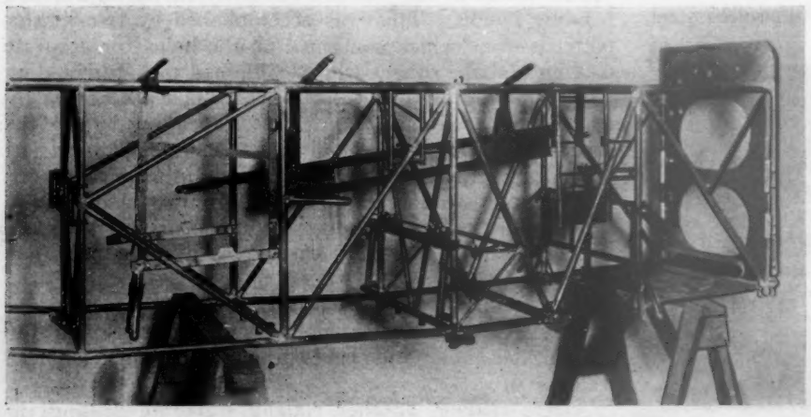
THE TIME SAVING by the use of fixtures in the Travel Air factory is very great. The first six-place monoplane fuselages were built without the aid of fixtures and required about 270 hr. as compared with 79 hr. in the present fixtures.

The underlying principles controlling the building of welding fixtures by this company are as follows:

1. Accuracy is of first importance, since it assures uniform flying conditions.
2. Simplicity in design cuts costs of building, cost of material, and speeds up production.
3. Permit rapid removal of finished part. If the fixture requires the use of wrenches for removing a large number of bolts, too much time is lost.
4. Joints to be welded should not make close contact with heavy parts of the fixture, resulting in the loss of heat and faulty welds.
5. The jigs must be constructed so that there is no restraint on the normal expansion and contraction of the piece during the welding operation.
6. A sequence of welding must be found by trial that will cause the least amount of distortion.
7. Welded joints should be complete in the fixture. The relation between part and fixture is apparent in case of distortion and measures can be taken to correct the same.
8. Measuring by the welder should not be necessary if the fixture has been scientifically designed and checked after construction.
9. Convenience for the welder.
10. Each fixture should be for one purpose wherever possible.

Fuselage Jigs

BEFORE DESCRIBING specific fuselage jigs in detail, it may be well to review briefly the general process of fuselage welding in its broadest terms. The struts and longerons are first cut to correct length and the ends machined for proper fit to the contour of the member to which they are to be joined. In the case of struts, a clearance of about $\frac{1}{32}$ in. is allowed at each end for expansion. Bent tubes should naturally be formed before assembly. No tubes should ever be forced into place, as with the consequent expansion of welding, a bow will be formed. The various members are placed in the welding jig and held rigidly but not firmly by the clamps. Order of welding is usually progressively from one end to the other along one side of the top truss. After the weld at one end of the top has cooled off, the other top side is likewise welded. This is necessary to obviate harmful shrinkage. Similar order should be followed in the bottom truss. Two welders, working simultaneously and opposite to each other at all times, so that equal temperatures are maintained, can also accomplish the same result.



Fuselage jigs and fixtures employed by the Chance Vought Corp.

THE PRACTICE followed at the Keystone plant is to make a layout of the top and bottom truss on a steel table (boiler plate or channel iron). Small angles are bolted to this table to receive the tubes in correct location, and also the brackets which receive the detail fittings which are to be welded to either of the structures. It is important that the detail fittings be welded first if the finished structure is to be accurate. This is to permit shrinkage of the cross members or longerons before they are tied together. All welding is completed with the exception of the telescopic joints which are held together by small tack welds. The top and bottom trusses are then placed in the assembly jig where the vertical members are fitted.

This assembly jig consists of channels bolted to a concrete base with steel blocks which receives the wing hinges, strut fittings, engine mount, tail post and a few stations between the tail post and rear wing hinge fittings. This channel-iron structure is well braced in all directions. All joints of the fuselage are then welded, leaving the telescopic joints of the longerons as a last operation. The final alignment is obtained by breaking the tack welds of the telescopic joints and completely welding one after another with the fuselage bolted in the jig.

THE FUSELAGE of the Great Lakes 2T-1 Training Plane is built of S.A.E. 4130 welded steel tubing throughout. This fuselage is built into one solid assembly including the engine bearer, which necessitates holding the location of engine mounting holes, wing hinge points, aileron control bearings, rudder post bearing, etc., to very close accuracy, as there is no chance to shim or alter these locations to correct misalignment. A set of twelve fixtures (not including duplicates for production) is required for one complete welded assembly. These fixtures are divided as follows:

> One for left-hand side; one for right-hand side; one for station No. 2; one for station No. 3; one for station No. 4; one for bottom bracing between stations No. 3 and No. 4; one for aileron bracing, sub-assembly and bottom bracing; one for top bracing between stations No. 3 and No. 4; one for main assembly of all above sub-assemblies and one for locating hinge points and rudder post bracket.

All large fixtures too heavy to handle are placed on trunnions enabling the welder to operate from one position, rotating the work to suit around a fore and aft axis. Due to the linear expansion of the longerons during the welding operations on the main fuselage fixtures, hinge points are not welded until the fuselage is removed from the main fixture.

IN THE FAIRCHILD PLANT the fuselages are built up in sections, the cabin part in two sections, and a third section for the after end of the fuselage. Since the latter can be more quickly produced, the tail piece is generally assembled to the cabin before the latter is removed from the jig. Jigs are built of structural steel.

ON THE FUSELAGE JIGS used by Curtiss for quantity production, provision is made for accurately locating the various fittings, wire pulls, lugs, etc., so that a minimum amount of time will be used for fitting in the final assembling. Another feature of this company's practice is the use of removable shims in those jigs and fixtures where the welded up part is subject to expansion or contraction. For example, in welding cross members to longerons, shims of proper thickness (determined by experience) are inserted between the inboard sides of the longeron tubes and the jig and after tightly clamping, the longerons and cross members are tack welded. The shims are then removed, the clamps made snug but not tight and the parts welded. When the welding is complete the assembly will have lined up properly in the jig but not so tightly that its removal is difficult. The use of these shims has largely done away with the cracks in or near welds.

THE BOEING AIRPLANE COMPANY is a pioneer in the use of electric arc welding in aircraft construction, and at present is one of the comparatively few airplane factories in the nation using this type of welding. For many years Boeing engineers have experimented with electric arc welding, with the result that at this time it has been developed to a high degree of efficiency. While torch welding is used to a certain extent at the Boeing plant, arc welding is employed generally in steel assemblies where strength is an essential factor, such as, for example, steel fuselage structures. In the construction of experimental airplanes, wooden jigs are used.

When this company enters production on a type of airplane that requires a welded steel fuselage, however, the assembly must be made in a permanent steel jig.

The jig for the 80-A fuselage, 55 ft. in length, was made of steel, assembled by bolting on a solid permanent steel base. Clamps, in which are locked the component parts of the fuselage, are intricate units assembled by welding. The alignment and accuracy of these clamps, are of course, features of cardinal importance. Small sub-assemblies are built up on benches before being locked in the main assembly jig for complete assemblage.

THE TRAVEL AIR fuselage welding fixture is built on a sturdy foundation, the two lower members are 4-in. x 12-in. x 24-ft. I-sections of structural steel. The principal uprights and the lower longeron cradle are built of 4-in. x 4-in. angle iron. All tubes rest in half-round locating blocks and are held in place by clamps working on the eccentric principle, one being loose while the other is holding the tube in place. All welded joints are completed in the fixture and the only welding remaining to be done after removing the fuselage from the fixture is the addition of small fittings.

IN STUDYING the problem of proper jigging for the "Corsair" fuselage, the Chance Vought Corp. recognized three fundamental systems of jigging used in the aircraft industry: (1) Integral or single jig assembly; (2) half side and tube jig assembly, and (3) sub-assembly revolving jigs. The integral or single non-revolving jig (where the structure can be removed after tacking and finished out of the jig) was regarded as the cheapest way to fabricate experimental or small order fuselages. The half side and cross tube jig was believed particularly adaptable for very large transport fuselages, where the sides are symmetrical and can be welded in a vertical position without revolving the jig, and where after removing a structure of this type, it can be used as a jig in itself to assemble horizontal cross tubes.

The holding of work in the jig is regarded as worthy of considerable study, in order that the welder may be enabled to finish the joint in one heat, thereby eliminating the chances of cracking tubes, which is particularly noticeable in chrome molybdenum steel structures. Much

time may be saved by having the work at the proper height, so that the welder may remain in an upright position, rather than to work overhead.

It has been found that under no condition should the expansion of a tube be restricted. It is far better practice to mill the tube ends to exact dimensions and merely use the jig to hold them in place at the proper stations, having the stops so arranged that the tube may expand freely at welding and contract to its own dimensions after cooling.

Alignment is simplified due to all the tubes being straightened at the sub-assembly welding operation, when heat is applied to the larger fittings, so that all contraction has taken place before this sub-assembly is placed in the main structural jigs. No excess metal is left for machining at hinge points or principal fittings.

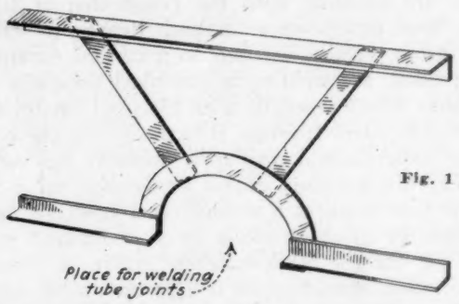


Fig. 1

Since pilot holes are placed in the fittings before welding, this means a minimum of jig reaming after welding.

Accuracy of the fuselage determines to a large degree the ease and speed of all other operations. Consequently, a tolerance of only $\frac{1}{32}$ in. is allowed throughout the design of the Stearman fuselage jig. For example, by building an accurate fuselage, it is possible to jig and cut cowling, thus greatly reducing the time required in cutting and fitting in the sheet-metal department.

Engine Mount Jigs

FORD PRACTICE uses two distinct jigs for center engine mounts, an assembly jig and a welding jig. The center engine mount assembly jig is composed of a flat square plate $\frac{1}{2}$ in. thick and sufficiently wide to permit the location of the engine mounting ring within its area. This plate is solidly bolted to a welded frame of angle iron so that it cannot change its position. On this plate the location of the engine mount ring is definitely fixed by the permanent installation of guiding brackets. At each of the four corners directly opposite to the plate are permanently located fittings similar to those mounted on the fuselage of the plane. The relation of these fittings to the location of the ring is constant.

The engine mount ring is located and loosely clamped on the face of the assembly jig. It is then heated and definitely located in its place. The tubing extending from the fuselage fittings to the ring is then installed and tack welded. When the whole mount is held together by this temporary welding it is taken out of the assembly jig and fastened to the welding jig.

The center mount welding jig is a stand made of steel. On this stand is mounted a plate $\frac{9}{16}$ in. thick and of such rectangular dimensions that it permits a center mount's legs to be bolted to the jig fittings, which represent the center engine mount fittings. The plate is welded to a spindle which is free to rotate within a sleeve bored in the stand. A locking device enables the welder to place the plate about the axis of the shaft in any desired position. It has been found, however, that due to the distortion caused by the heat of the welding torches an addition must be made to this jig so that the ring of the engine mount, as well as its legs, will be solidly held by fittings to the jig. This is expected to nullify the influence of the heat. It has been estimated that the saving in time on the welding of the center mount will be in excess of 20 per cent of the total.

The ring of the engine mount being constructed is clamped on the plate after it has been forced to assume a perfect circular shape. The main post of the engine mount is then secured fast to the fittings on the jig. The engine mount fittings are next placed into the jig fittings, and the tubing installed in order. As the operation progresses the tubing is tack welded. The jig has also location points for the oil tank brackets. When the mount has been tackwelded throughout, it is taken out of the assembly jig and fastened to the welding jig.

The outboard engine mount welding jig has made possible a saving of almost 50 per cent in the time formerly necessary to weld the outboard engine mounts. This jig consists of a plate $\frac{3}{4}$ in. thick and circular in shape with a diameter of $73\frac{1}{8}$ in. It is mounted on a stand in the same manner as previously described for the center mount welding jig. However, the jig is of such dimensions that it is necessary to hold it to the floor. Using the plate as its base a frame work of angle iron is welded on it. On this frame work are placed four "V" blocks which serve to locate the ring. At the same time the mount fittings are bolted to the engine mount jig fittings which correspond to those to which the mount is suspended on the center section. Once this is accomplished the welder welds all of the mount that he can while he is in one position. When he has finished, he turns the plate about the axis of the shaft on which it is welded, to whatever place he may wish to set it.

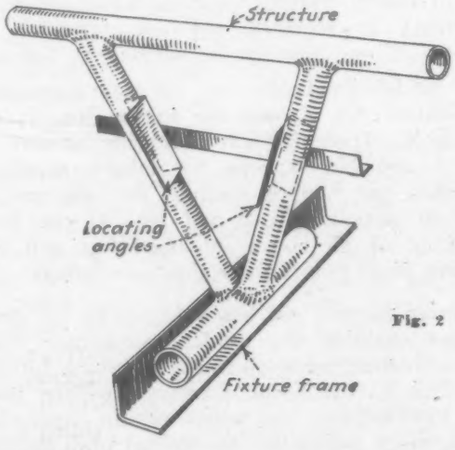


Fig. 2

THE ENGINE BEARER of the Martin PM-1 flying boat is composed of sub-assemblies in order to increase the speed of production and also to take up the shrinkage in these assemblies so that the shrinkage will not all come in the final assembly fixture. The engine ring and the diagonal brace struts leading to the tubes that form a square with two bends on two sides are part of one sub-assembly. "V" braces at the rear constitute another sub-assembly of which there are complete assembly fixtures. The large rings that are made up from small tubes are a sub-assembly in themselves. Afterwards,

they are all placed in this complete assembly fixture and welded together in such a way that the last weld is made at the end of the "A" braces leaving only one shrinkage to be taken care of in the final welding.

IN BUILDING the Stearman engine mount jig, the most difficult and the first thing to determine is the shrinkage to allow for the engine fittings. The dimensions must be held to $\frac{1}{64}$ in. In building a mount where the floating clamps are used on the engine mount ring, the shrinkage can be held and calculated fairly easy. In a ring of $23\frac{3}{8}$ in. diameter, $\frac{3}{32}$ in. is allowed and it is found that the mount can be put on the engine very easily. Where welded clamps are used, the procedure is to take two plates (boiler), lay the hole centers out, adding $\frac{1}{8}$ in. to the diameter of the ring. The ring is then put between the two plates, the two bolted together and the clamps welded in place. The clamp welding is completed and the ring transferred to the engine mount jig.

In building a jig of the type shown, $\frac{1}{16}$ in. is allowed for overall shrinkage. The base blocks are mounted on a cast plate, the upper plate set up and the supports (with clamps for holding upright tubes) attached and the jig is ready for trial.

The base blocks are built with a spring attachment so that it will take the strain off the jig and at the same time tend to hold down the shrinkage. The sketch (Fig. 3) shows the type block used with leg in place.

On the latest jig, the cast base is being replaced with $\frac{5}{8}$ in. boiler plate, supporting the upper ring plate with 8-in. scrap casing. In this way, the cost of the jig can be cut down 40 per cent as it is much easier to locate the tube support clamps.

Wing Spar Jigs

THE WING SPAR JIG used by Keystone, is quite simple. It is a complete layout of the structure on a steel table (boiler plate or channel iron). Small angles are bolted to this table to receive the tubes in their proper location as well as steel blocks to receive the wing hinge and strut fittings. In a wing spar of tubular construction, it is customary that the diagonal tubes be tack welded to the top and bottom members as a first operation; next the strut and wing hinge fittings are completely welded, followed by the final welding of the diagonal tubes, generally starting at the center of the spar and working out. To prevent warpage, the best procedure is to weld completely the diagonal members one to another, leaving the joints where the top and bottom tubes telescope free to move, welding these as a last operation. This is to permit shrinkage and yet hold the spar to its correct length. The finished spar is usually accurate within $\frac{1}{8}$ in.

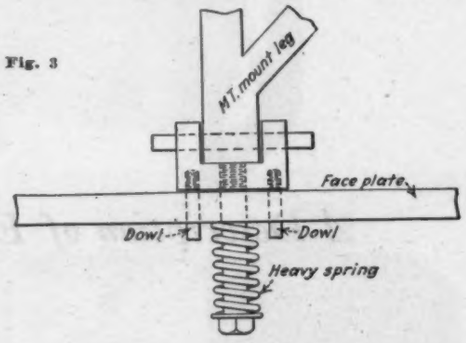
Tail Surfaces and Ailerons

FAIRCHILD STABILIZERS are first constructed in jigs used in tack welding the various tubes together, preliminary to placing the assembled unit in another jig, which is constructed so as to prevent warping during the welding process. This final welding starts at the middle of the stabilizer and proceeds alternately out to the ends. Quick action clamps, with a hollowed-out seat, are used to hold the members in proper alignment.

WELDING JIGS used by Keystone for tail surfaces, such as elevators or stabilizers, follow along simple lines. The spar jig, if the structure is a truss in design, follows the one described under wing spar jigs. If it is a single tube it is only necessary to have fittings to receive the hinges and angles to hold the tubes. The jig for the complete structure is also a layout on a steel table.

Pieces of angle iron of the desired size are bolted to the table in a vertical position and proper location to receive the ribs and spars with steel plates, bolts and wingnuts, to hold the assembly before welding. The

Fig. 3



welding procedure of an assembly such as this is not very difficult, with the exception of the alignment of the hinge points, which is easily worked out after the first two or three are completed.

IN BUILDING tail surface jigs, the practice at the Stearman factory is to use standard cast-iron tube supports, cutting the blocks to the correct height and putting two $\frac{5}{16}$-in. pins in the top to act as guides. These blocks are all located on the plate, the curved portion of the jig built and tried out before the hinge blocks are put on. When finally located, the blocks are all numbered and doweled to the cast-iron surface plate. Because of the expense of the surface plate, all blocks are made removable so that the plate may be used for other model tail surfaces.

The jig used by Ford for exhaust manifolds consists of a steel table sufficiently large in diameter to accommodate the Standard exhaust manifolds used on Ford planes. On this table are welded a dozen brackets having a semi-circular shape; on each of these brackets a semi-circular clamp is hinged, thus forming a full circle when the clamp is closed. The manifolds are composed of sections of sheet metal welded together. These sections come from the sheet-metal department pressed in semi-circular form. When the edges are trimmed, one half is placed on the bracket and the other half on top of it and clamped by the bracket lock. These two pieces are then welded together. At a predetermined distance the exhaust flanges are located on stationary hinges and bolted thereon. They are then welded to the specified sheet-metal piping conducting to the collector ring.

Good welding jig design is a combination of technique, good judgment and common sense. To some extent it is dependent upon experience, and to a far greater extent upon the ability to profit by one's own mistakes. The welding foreman is usually a far better designer of welding jigs than a general draftsman.

It should be borne in mind that the effects of poor welding jigs extend far beyond the shop. Failures which occur in the field due to small cracks close to welded seams can often be traced back to welding jigs which did not allow sufficient freedom of movement for contraction and expansion during welding, or to incorrect order of welding of the several joints.

STUDENT INSTRUCTION BY

By Duncan Sinclair
Alfred Graham and Co., Ltd.
Slough, England

A Description of Equipment Developed in England Which Talk to the Student Flying Solo

BRITISH Air Navigation Regulations demand that an aircraft plying for hire or reward is regarded as coming within two categories from a radio point of view: (a) Those capable of carrying more than five but less than ten persons including the crew; (b) Those capable of carrying ten or more persons including the crew. Categories (a) and (b) form the "compulsorily fitted" class, required to carry radio, and those machines which carry less than five persons form the "voluntarily fitted" class.

The commercial scope for radio in the field of the "voluntarily fitted" machine is somewhat small in Great Britain, but it is a field which recently has showed signs of developing quite rapidly, and since it embraces the private owner and the amateur pilot, it should be treated as a matter of no inconsiderable importance. If we are to envisage an aircraft industry developing on lines similar to those of the motor-car industry, too much care cannot be taken now so far as radio equipment is concerned.

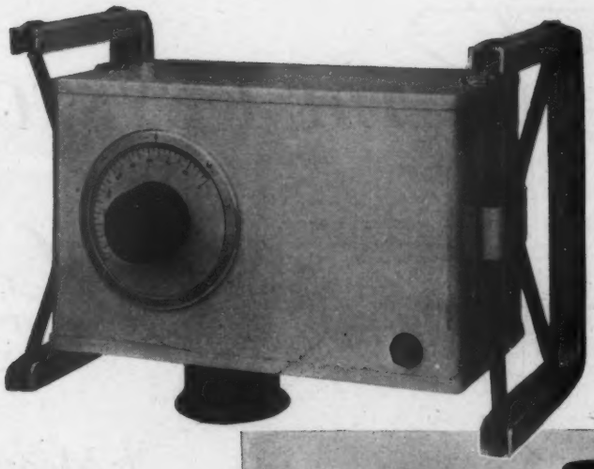
The most interesting immediate possibility is in connection with school work. The system hitherto adopted almost universally has been to make use of the Moth or Avian class of light airplane, the instructor occupying the front seat and the pupil sitting in the rear seat usually occupied by the pilot. For purposes of giving instructions and advice, communication has been carried on by means of a voice pipe system, which, though quite simple, is very efficient. Two tubes are used, one running from the instructor's mouthpiece to the pupil's ear-piece, and the other from the pupil's mouthpiece to the instructor's ear-piece. At a convenient point along the course of these two tubes a small by-pass unit is fitted to the side of the fuselage, and the two tubes pass side by side through this unit and have small tubular borings connecting them. The effect of this arrangement is that either of the two persons concerned can hear what he himself is saying without detrimentally affecting the hearing of the other.

This system of voice pipes is extremely easy to install, and needs no maintenance whatever. In fitting radio to a light airplane, therefore, it seems natural to combine this already useful system with the radio equipment, and the results of experiments recently concluded to this end, are highly satisfactory.

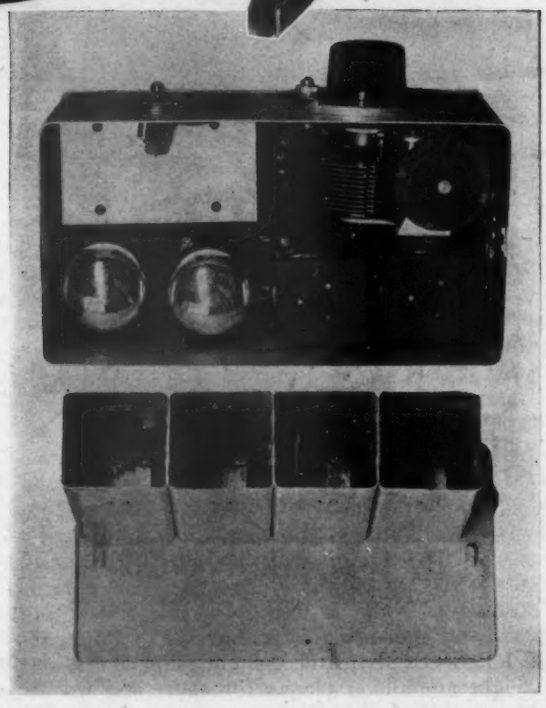
THE ACCEPTED practice in training a pupil to fly involves some five to fifteen hours of dual instruction in the air before the pupil can be considered safe enough to be allowed to fly solo. Throughout this preliminary period, he becomes accustomed to receiving his flying instructions through the voice pipe, and there is quite a sound psychological reason why he should continue to do

A view of the cockpit showing a part of the voice pipe system

Radio



Permits the Instructor to



Above. Type G.A.6 receiver manufactured by Alfred Graham & Co., Ltd., England. Below. A top view of type G.A.6 receiver with cover removed.

so when radio is fitted and the instructor leaves the machine. For this purpose, a light plane receiver has just been introduced by Alfred Graham & Co., Ltd., Slough, England. This receiver itself weighs just under 4½ lb., and its dimensions are 5½ x 4¾ x 8¾ in. One single tuning control is employed, operated by the knob and dial at the left end of the unit. The tuning range is from 600 to 1,000 meters, and two screened high-frequency stages precede a detector and one specially designed transformer output stage. A number of new patents are involved in the design.

A screened battery box contains small high and low tension batteries of improved type, and the battery feed is supplied to the receiver through a single screened multi-core system. The whole installation can be completely renewed in a period not exceeding five minutes. The machine itself is used as the "ground" of the receiving system, and the aerial employed is fitted between wing tips and tail, and is so designed as not to interfere with the folding of the wings.

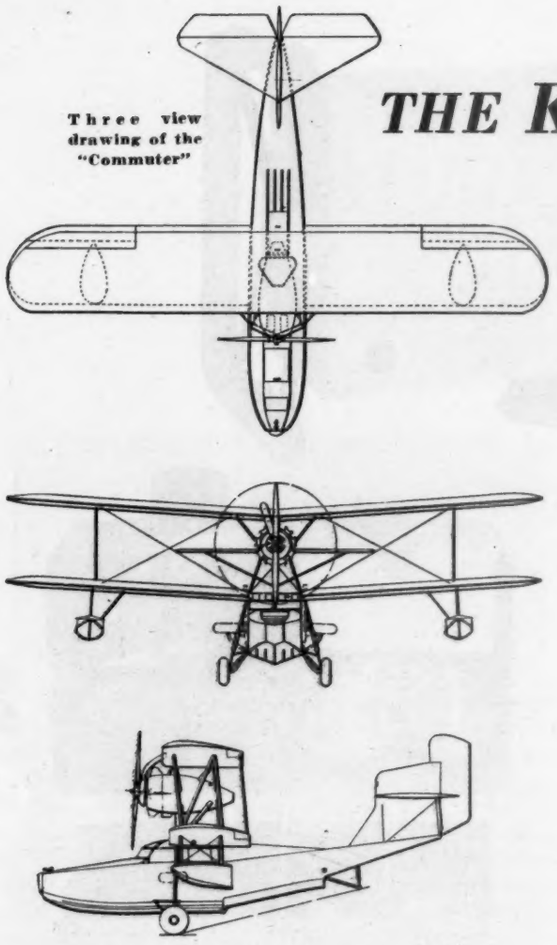
The output leads of the receiver are connected to a very light loud speaker chassis built into the by-pass unit of the voice tube installation, and a single switch is provided for turning the receiver on and off. There are no additional fittings involved.

WHEN the pupil has arrived at that stage of his training where he may be considered able to make his first solo flight, the instructor steps out of the machine and switches on the radio set. He then goes to the wireless transmitter situated at any convenient point on the ground level within the airport, and the pupil takes off by himself. Should the instructor have occasion to criticise the flying of his pupil he can immediately switch on the ground station transmitter and speak to the machine as he wishes, and it will be observed that the pupil hears the same orders in exactly the same voice and manner as if the instructor were still in the machine with him.

During a recent flight made to Manchester and back on a Moth, signals from the Croydon station were received with this equipment, using fixed aerials of the type described, right up to Manchester at good strength. At the Heston Airport, where the Graham Company is carrying out some of its research work, it is possible to hear machines on the air routes well over the French coast, while signals from Croydon are audible clearly, from a pair of phones, over 50 yd. from the machine.

As to the meteorological aspect of the question, a machine fitted with an apparatus with a range of this nature need never be without current weather news. The photograph of the Heston Airport installation shows the apparatus on the ground for purposes of school instruction. This apparatus, point to point with other fields, has a telephony range of 150-300 miles, depending upon circumstances.

A light-weight transmitter to work in conjunction with the G.A.6 Receiver will also be marketed very shortly, and the total "all-in" weight of the equipment including the generator for high and low tension supplies to both the transmitter and receiver will be less than 35 lb., with a maximum range of 60 miles transmitting from machine to ground.



Three view drawing of the "Commuter"

THE KEYSTONE-LOENING "Commuter"

A Medium Weight Amphibion for Sport and Private Use

By LESLIE E. NEVILLE
Technical Editor of AVIATION

IN RESPONSE to the current demand for medium weight amphibion planes for sport and private use the Keystone-Loening Division of the Curtiss-Wright Corp. has developed and produced the Model K-84 "Commuter." The first of these planes was completed in April, 1929, and, following several months of test flying, was placed in production. First experimental models were built at the Loening plant in New York and actual production has been in progress for some months at the Keystone plant in Bristol, Pa.

Since the first experimental Commuter was built a number of modifications, mostly of a minor nature, have been incorporated in the design and it is our purpose here to describe in some detail the current production model of the plane. A large number of these airplanes is now in service in various parts of the country. The Model K-84 "Commuter" is manufactured under approved type certificate No. 219. Mr. J. A. Neady is the project engineer.

Having many of the features of the Keystone-Loening amphibion "Air Yacht," the K-84 "Commuter" is a four-place, single engine biplane amphibion of the central hull type. The wing and tail surface structures follow conventional practice, while the hull is somewhat unique in construction. The entire machine is designed with unusual forethought for the manufacturing department and it is probable that there are few current commercial airplane designs that lend themselves as well to large quantity production.

The Commuter has a wing span of 40 ft., an overall length of 32 ft. 4½ in. and an overall height of 14 ft. The weight empty is 2,927 lb. and the useful load 1,223 lb., giving a gross weight of 4,150 lb. The Wright J-6 300 hp. engine is used.

INASMUCH AS the wing construction is conventional, it will not be described in great detail here. Spruce is used throughout the structure, the spars being solid 1x6 for the front and 1x5½ for the rear. Ribs are spaced approximately 11 in. apart and are of Warren Truss gusseted construction. Drag bracing and leading and trailing edge construction follow the generally accepted standards for wooden wings, metal compression members of elliptical section being used and attached by fittings, the details of which are shown in one of the accompanying illustrations. Ailerons and tail surfaces follow the same construction standards and, as in the case of the wings, are covered with fabric.

The wings are rectangular in plan form and built in four panels without a center section. Their total area is 437 sq.ft., of which 30 sq.ft. constitute the four ailerons. The N-22 airfoil section is employed. Chord and gap are both 6 ft., and 6 in. of positive stagger is employed in the wing setting. Both wings are set at equal incidence and dihedral, the incidence being 2 deg. and the dihedral 3¾ deg.

ALUMINUM ALLOY is used for the most part in the construction of the hull, excepting the highly stressed points where steel is employed. No rivets whatsoever are used in the primary structure, fabrication being accomplished entirely through the use of 10-32 truss head machine screws and water tightness accomplished by the use of marine glue and tape at all the joints and close spacing of the machine screws.

The design of the hull is such that all fastening and final assembly is done from the outside, all sheeting is flat and no bumping is required, and relatively few sections are used for the structural members. The alumi-

The Commuter on the water with wheels retracted showing convenience afforded by the forward hatch

num alloy sheets used for the hull bottom are $\frac{1}{16}$ in. in thickness, while those for the sides are $\frac{1}{32}$ in. There are some 13 sheets employed in the construction of the entire hull and the maximum sheet width is 48 in. The sheets are cut and drilled in templets several at a time, after which as many as possible of the stiffening members of the structure are bolted to them. Diagonal structural members are bolted to the side sheets, while bulkheads and floor trusses are attached to the bottom sheets. After this has been completed, the final assembly consists mainly of bolting chine, keel and other main structural members to the outside of the hull. Each bolt is immersed in marine glue before the insertion and service conditions have proven that it is unnecessary to pein the bolts after the screws have been tightened, partly due to the marine glue and partly to the closeness of the bolt spacing.

The floor frames are tied into the longitudinal stiffening members, keel, and chine, and consist of sheet material with lightening holes. This sheet material is reinforced by vertical stiffeners made up from sheet stock formed into simple flanged V-section. This general type of reinforcement is also used at other points in the hull and floats. These frames are on 7 in. centers at the step.

Seven bulkheads are provided, built up of aluminum alloy section with square tube V reinforcement, tubing being $1\frac{1}{4}$x$1\frac{1}{4}$x$\frac{1}{16}$ in. Water tight bulkheads are installed fore and aft. A padded buffer is built into the nose.

WING FLOATS are similar in construction to the hull and each has two watertight bulkheads and three compartments. As in the case of the hull, no bumping of sheet material is necessary and all final assembly is accomplished by bolting externally applied angle section members. Each float is attached to the wing by four bolts and braced on the inboard side with aluminum alloy struts. The vertical struts supporting the floats pass through the upper surface of the floats and are anchored in castings attached by steel bolts to the structure members in the fore and aft compartments.

As previously mentioned, the design is such that a minimum of section types and sizes is used in the hull and float structures. All of these are standard Aluminum Company sections with the possible exception of the keel which is similar to the standard Aluminum Company member of this type but is slightly different in dimensions. The chine angle member is $1\frac{3}{4}$x$1\frac{3}{4}$x$\frac{1}{8}$ in., the keelsons are $\frac{3}{4}$ in. half oval, top longerons are $1\frac{3}{4}$x$1\frac{3}{4}$x$\frac{1}{8}$ in. angle. Diagonals are $\frac{3}{4}$x$1\frac{5}{16}$x$\frac{3}{32}$ in. bulb angle and the sheet stiffening members are $\frac{1}{2}$x$\frac{7}{8}$x$\frac{1}{16}$ in. bulb angle. In addition to these and the square section used in the bulkhead, the only other member employed in the primary structure, is a $\frac{3}{4}$x$\frac{3}{4}$x$\frac{1}{16}$ in. angle which is used in a number of appropriate places.

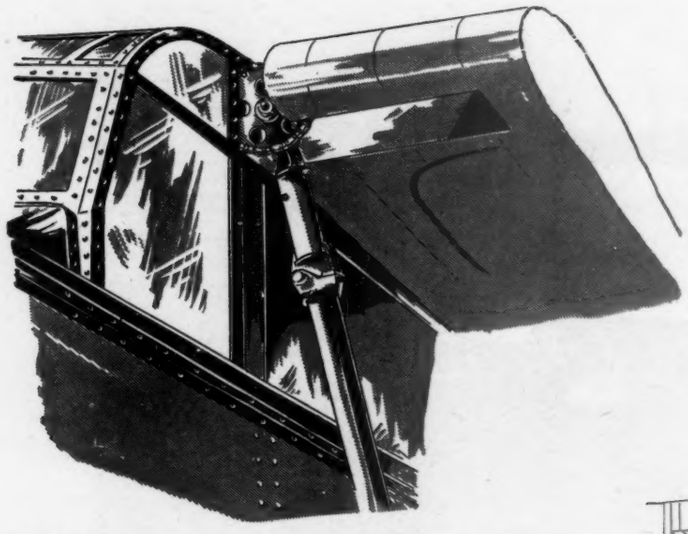
Following a number of modifications, the retractable landing gear finally adopted for the "Commuter" is cable operated. This landing gear was designed to supersede the hydraulic type of the earlier models and has a number of advantages, the principal of which is the weight saving of 30 to 40 lb. which it represents. In addition it makes it possible to draw the wheels entirely out of the water and therefore eliminates the undesirable effect of spray being thrown up about the windows.

Each portion of the landing gear consists essentially of a cantilever axle unit and a retracting arm attached respectively to the lower and upper ends of a standard Travel Air shock strut. The axle unit is constructed entirely of chrome molybdenum steel tubing and 8.50x10 Goodrich low pressure tires are used.

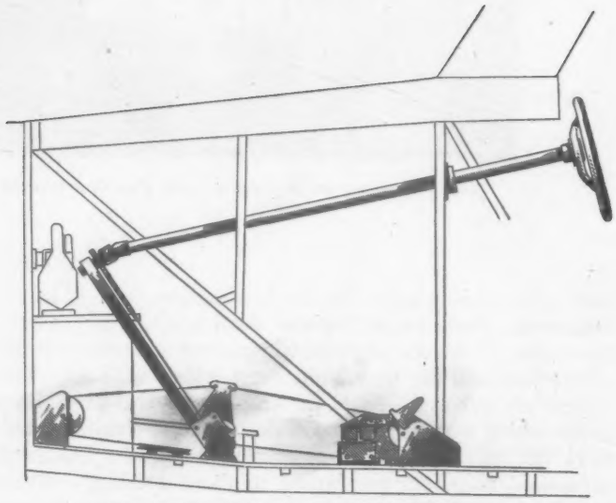
The retracting mechanism hand crank is located at the left side of the right hand, forward seat in such a position as to be accessible to the occupants of both front seats. Reduction and transmission of forces required in raising and lowering the gear from the shock strut and retracting arm connection to the hand crank are obtained by means of sprockets, chains and spare gears. The retracting arm has an angular travel of approximately 180 deg., carrying the shock strut through a slot in the wing to its upper or lower position. The retracting mechanism is locked in the terminal positions by a ratchet operated by a lever located at the rear of the hand crank. Adjustable stops have been provided on the hand crankshaft to prevent strain being placed on the retracting

INTERESTING DESIGN

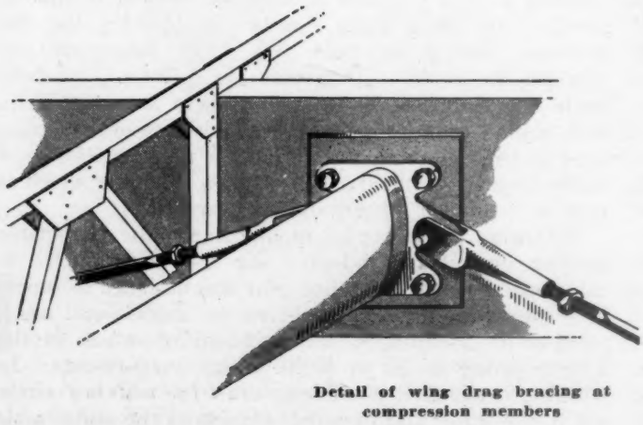
DETAILS OF THE



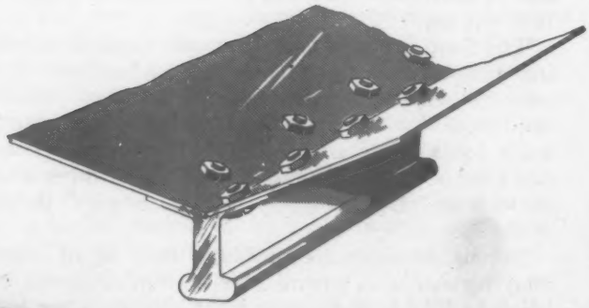
Actuating arm and sprocket of the Commuter retractable landing gear. This simple mechanism was adopted after the hydraulic system was discarded

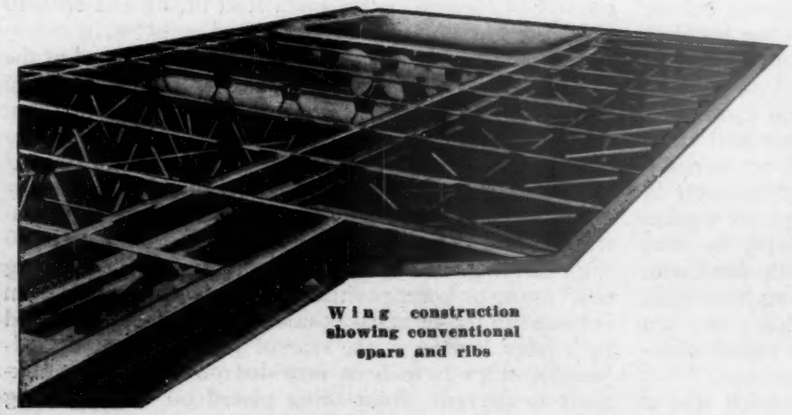


The push pull elevator control with column far removed from the pilot's cockpit



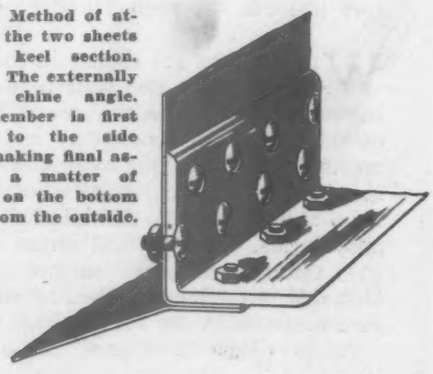
Detail of wing drag bracing at compression members





Wing construction showing conventional spars and ribs

Above: Method of attaching the two sheets to the keel section. Below: The externally applied chine angle. This member is first bolted to the side sheet, making final assembly a matter of bolting on the bottom sheet from the outside.

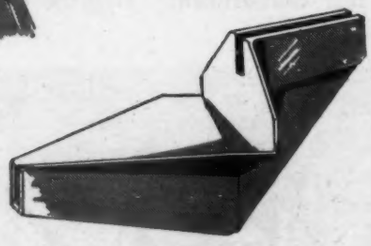


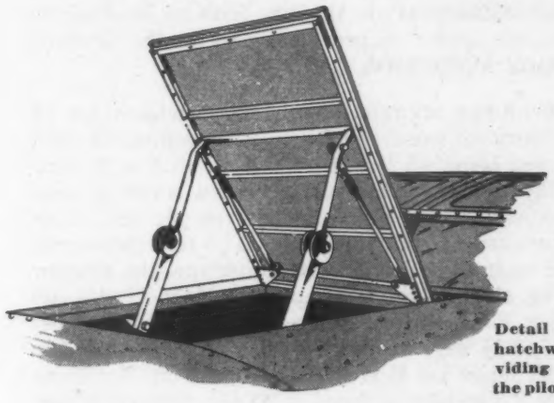
AND CONSTRUCTION

"Commuter"

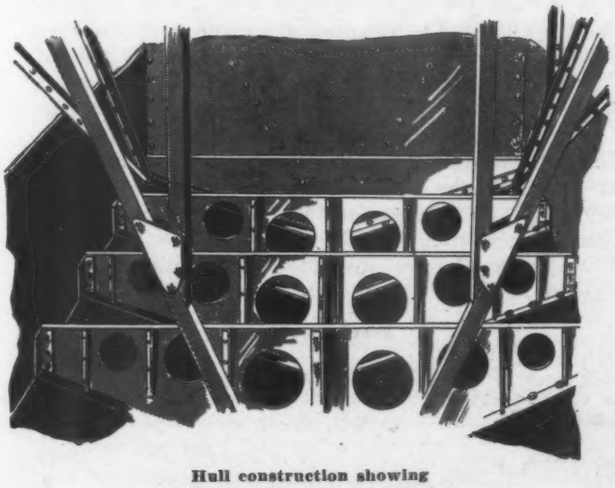
Detail of the bulkhead construction below the deck

One of the castings used for reinforcement of the hull at the step



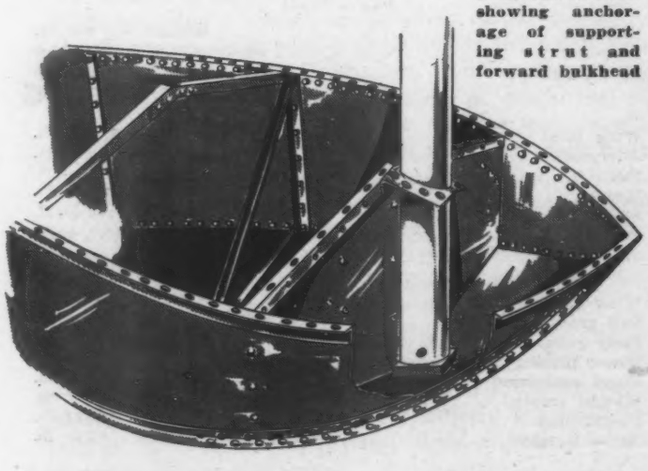


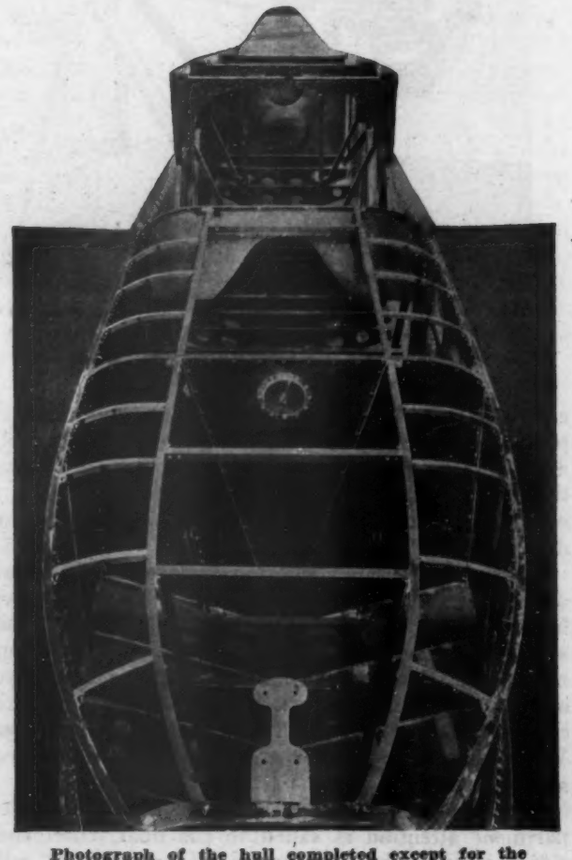
Detail of front hatchway providing access to the pilot chamber



Hull construction showing the floor frames and bulkhead members as well as bottom and side sheeting

Float construction showing anchorage of supporting strut and forward bulkhead



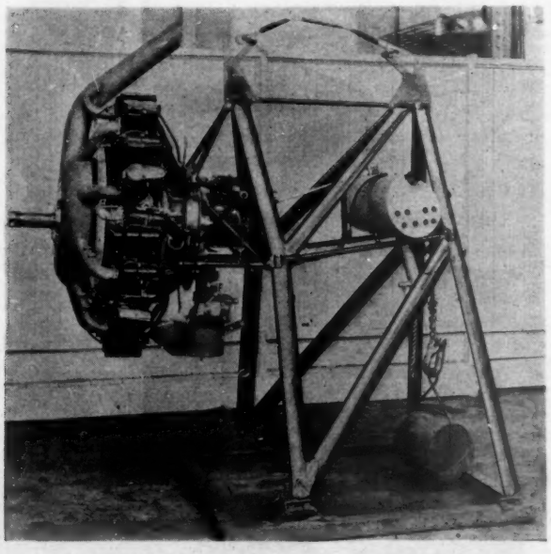


Photograph of the hull completed except for the deck sheeting which is laid over and bolted to the angle members as in the case of the bottom sheets

mechanism when upper and lower positions are reached with the hand crank. The force required on the hand crank to raise and lower the wheels is small, as is also the time required for either operation. This landing gear has been adapted as an improvement over the hydraulically retracted type in the first models and the subsequent mechanical type with air wheels and no shock struts.

The tail skid of the "Commuter" has also undergone a process of evolution. In its present form it consists essentially of a vertically mounted standard Aero shock strut with forked radius members attached to the hull structure at the step.

THE INTERIOR of the "Commuter" is extremely simple in the matter of finishing, no effort being made to cover the structural members, as it was thought desirable that they be exposed so that it is possible to watch them for any signs of corrosion. Two hatches and one emergency exit are provided. Entrance is normally gained through the rear hatch and down a companion ladder to the rear compartment. Baggage racks are placed on either side of the aisle passing through the rear compartment. The cabin is 7 ft. long by 4 ft. wide and has 4 ft. 4 in. headroom. It seats four persons, the two in the front seats having complete dual control. The emergency exit is triangular in form and is located in the deck above the two rear seats.



The cabane struts and engine mount are made up as a sub-assembly and installed at the appropriate stage in the production process

For convenience in anchoring, picking up moorings and other operations on the water a hatch has been provided in the forward deck and easily accessible from the pilot's seat. All ground tackle is kept in the forward compartment. This hatch is so designed that it can be opened only from the inside and serves as an additional exit in case of emergency or for various maneuvers on the water. When closed it is held rigidly in place by means of a shock cord arrangement.

In addition to the usual equipment in the control compartment attention is called to the dual wheel control which is somewhat unusual in design. Instead of the usual hinged column moving backward and forward for elevator control the wheels are mounted on a push pull shaft passing through the instrument board and hinged to a column or arm some distance forward of the control compartment. In this way control space is kept clean and it is unnecessary for the pilots to climb over the control column in getting in and out of their seats. The rudder pedal design is also of interest. Each set of pedals is mounted on a pair of cross bars so pivoted that the foot follows a linear rather than a circular path when the pedal is actuated. In accord with the conventional practice, engine instruments are on the right of the board and flight instruments on the left with an appreciable cutout in the center to provide access to the forward compartment of the hatch.

AS PREVIOUSLY MENTIONED, the tail surfaces are of conventional wood and fabric construction, the total vertical area being 45.2 sq.ft., of which 16.3 sq.ft. constitutes the rudder. This surface has a travel of plus or minus 30 deg. and approximately ten per cent of its area is forward of the hinge line. The total horizontal area is 62 sq.ft. of which 22 sq.ft. constitutes the elevator area. The elevator travel is approximately 25 deg. up and 20 deg. down and the range of the stabilizer adjustment minus 3½ deg. to plus 1½ deg. Both the elevator and rudder hinge are located 18 ft. 6 in. from the center of gravity, The aileron travel is 20 deg. up and 20 deg. down.

The Wright J-6 engine is fitted with a 9 ft. diameter metal propeller and is mounted on cabane struts between the wings. Fuel tanks are built in the inboard ends of the lower wings and are two in number, each having a capacity of 35 gal. The cabane struts and engine mounting are completely assembled as a unit in the manufacturing process and attached to the hull. Four bolts are used to attach the upper wings to the cabane struts which, like the interplane "N" struts, are made of streamline steel tubing.

The specifications as furnished by the manufacturer are as follows:

Dimensions

Overall length	32 ft. 4½ in.
Overall height	14 ft.
Span	40 ft.
Stagger	6 in.
Gap	6 ft.
Wing section	N-22
Chord	6 ft.
Incidence	2 deg.
Dihedral	3½ deg.
Wing loading (lb. per sq.ft.)	9.49
Power loading (lb. per hp.)	13.8

Power Plant

Engine	Wright J-6, 300 hp.
Propeller	2 blade, 9 ft. 6 in. diameter
Fuel capacity	70 gal.

Areas

Wing total	437 sq.ft.
Ailerons	30 sq.ft.
Fin	28.9 sq.ft.
Rudder	16.3 sq.ft.
Stabilizer	40 sq.ft.
Elevator	22.0 sq.ft.

Weights

Wing group	613 lb.
Tail group	122.7 lb.
Body group	1,031.4 lb.
Power plant	806 lb.
Fixed equipment	353.9 lb.
Weight empty	2,927 lb.
Useful load	1,223 lb.
Gross weight	4,150 lb.

PILOT LICENSES vs. *Solo Time*

A Report on a Questionnaire Survey to Obtain a Cross-Section of Past, Present and Future Activities of Licensed Pilots and Students in This Country

By R. SIDNEY BOWEN, JR.
Associate Editor of AVIATION

THE result of a questionnaire is usually a great mass of statistics, at first glance baffling to the average mind. However, when eventually analyzed and broken down into a concise and understandable form they present a story that is not only interesting, but of real value. Particularly is that so in the case of a questionnaire survey on various types of flying licenses recently conducted by the Statistical and Research Department of AVIATION.

The records showing that some ten thousand odd men and women hold a flying license in this country, it was decided to select a definite number of names from the lists of private and transport license holders. The primary purpose of the survey was to analyze the flying records of those who had just taken up the art, or were merely flying for pleasure, and of those who were ostensibly earning their livelihood by their flying ability. Therefore, in view of the fact that a limited commercial license exists principally as a stepping stone toward the securing of a transport license, it was not believed to be of any importance to the survey to consider the limited commercial list.

The number to be selected from each list was put at 250, and in order that a fair cross-sectional picture might be obtained the names were picked entirely at random. Every state was represented. The percentage of returns was quite pleasing, a total of 54 per cent of the holders of private pilot's licenses sent in their cards, and in the case of the transport pilot license holders the return percentage was only five per cent less. To anyone who has never administered a questionnaire that proportion of returns may not seem impressive. Those with experience of their own will recognize it as exceptionally high.

To supplement the license picture, a similar questionnaire was sent out to a number of holders of student permits issued 18 months before the date of the survey.

As might have been foreseen, the percentage of returns from the student permit questionnaire was only half as great as in the case of the private pilot and transport pilot questionnaires. Undoubtedly, in the 18 months since their permits were secured a number of the ex-students had completely disappeared from the aeronautical ranks. Those who have entirely dropped their interest in flying would be least likely to bother with a questionnaire of any sort.

To begin with, it seems that the student permit holders, almost to a man, were attracted to the art of flying by the financial possibilities it seemed to hold for him or her who finally obtained Department of Commerce permission to fly for hire or reward. But in the vast majority of cases that lucky day is still far distant, for the reason that "funds on hand are insufficient to permit John Jones or Mary Dugan to continue with instruction for the time being." However, practically all of the temporarily so unfortunately situated persons are still very keen about flying, and are most desirious of carrying on with the good work at the earliest opportunity.

There are, though, one or two outstanding exceptions. One gentleman who claims a total of 115 hours of solo has forsaken his aeronautical aspirations due to the fact that . . . "there is too much red tape attached to the securing of a private license." Another chap has been forced to do the same thing as a result of "orders from headquarters." In this particular case Mother and Dad represent headquarters, and refuse to continue to produce the money necessary for the defraying of instruction costs. But the vast majority, as already mentioned, are very eager to make the grade to that promised land where a transport license is the card of admission.

THE PRIVATE PILOT returns bring out some particularly interesting points. One, for example, is that over 74 per cent of persons now holding private pilot licenses, learned to fly and obtained that license in the last three years. And to be even more probing, a little over a third of that number have begun to fly only within the last year. Another item of interest is the fact that 41 per cent of the private pilots making returns have only 100 hours or less of solo time to their credit. From the same mass of statistics we find that 40 per cent of the private license group took up flying for a sport.

Therefore, we are able to obtain some idea relative to the amount of flying being done these days by private pilots whose incomes permit them to fly for pleasure. The answer seems to be that in reality there is not nearly as much pleasure flying being done as we somtimes believe. A man who averages little more than 30 hours a year, or a total of 100 hours in three years, can hardly even call himself a pilot. The deduction is that a great number of private pilots are barely doing the minimum amount of flying required to continue to hold rating.

And from inquiries as to the reason for such a limited amount of flying by a select group of private pilot license holders it develops that cost, inadequate airports, and the press of office business are the principle governing factors.

The present day possibilities of the private plane market are somewhat dimmed when we study the questionnaire returns. The figures tell us that only 36 per cent of the private pilots who answered our questionnaire own their own planes. If that were a representative figure for the total number of private pilot licenses issued, which on March 31, 1930 was 4162, it would work out that there are approximately 1510 private owners or part-owners among the private licensees. In practice that figure is undoubtedly too high, for the proportion of returns to such a questionnaire would be higher among owners than non-owners.

Some idea as to the number of war time pilots who have again felt the urge to fly may be obtained from the knowledge that 15 per cent of the private pilot license holders have been flying over ten years. This percentage of course does not include transport pilots with over ten years of flying. Yet once again we find that the amount of private flying is quite limited, because only a little less than half of the "ten year" private license holders have over 1000 hours to their credit. And of course in most such cases the majority of hours spent in the air were spent there during the war period.

Although 35 per cent of the private pilot license holders took up flying with the idea of securing a flying position, only 7.4 per cent are now engaged in such work . . . . 6.7 per cent in the industry, and .7 per cent in non-aero companies. That would seem to indicate that the remaining 27.8 per cent are still job hunting, or else have temporarily given up the idea of flying for a living while they work for a better license. Yet on the other hand that may not be the case. Perhaps their flying ability helped them to secure a non-flying position . . . . . the statistics tell us that 33 per cent of the private license-holders are so engaged in the industry which of course indicates that some of those who primarily took up flying as a sport changed their minds later on. Of the total private license holders 46 per cent are not connected with the industry in any way. The other 14 per cent were of uncertain status.

The break-down of the survey according to time in the air, and length of time flying should prove of interest:

Flying 1 year or less	24 per cent
Flying 1 year to 3 years	50 per cent
Flying 3 years to 5 years	6 per cent
Flying 5 years to 10 years	4 per cent
Flying over 10 years	16 per cent
Solo time of 100 hours or less	41 per cent
Solo time of 101 to 250 hours	31 per cent
Solo time of 251 to 500 hours	12 per cent
Solo time of 501 to 1000 hours	8 per cent
Solo time of over 1000 hours	8 per cent

The transport pilot license survey gives us quite a different picture. In the first place, 50 per cent of the gentlemen who hold a transport pilot license have been engaged in flying for over ten years. And what is perhaps even more significant 41 per cent are now engaged in a flying capacity in the industry, and 7 per cent hold flying positions with non-aero companies. Some of the others not included in the above percentages are probably out of a job just now or else have given up flying for a desk job . . . . the statistics show us that of the total number of transport pilot license holders who answered our questionnaire, 85.1 per cent have been professionally employed as pilots at some time or other.

OF COURSE it should be taken into consideration that oftentimes a questionnaire is not accurately answered. And in this case some transport pilot holders may have considered war service as professional piloting. To many of us war flying was pleasure flying, no less!

The same idea may have held true with reference to the reason for taking up flying. The answers to that question show that 40 per cent took up flying as a profession, and 35 per cent took up flying for military reason. But in view of the fact that ten years ago there was little if any commercial flying, and that 50 per cent of the present transport pilot license holders have been flying for over ten years, it follows that a great number of the transport pilot included in the 40 per cent figure were in reality originally military pilots. Their statement presumably applies to their reason for continuing after the war. Of the remaining 25 per cent who stated a reason for learning to fly, 16 per cent did so for sport, and 9 per cent took instruction because of their general interest in the art.

One particular item of interest brought out by the questionnaire returns is the fact that only 10 per cent of the present transport pilot license holders have learned to fly since 1927. But in the case of private pilot licenses it will be remembered that over seventy-four per cent learned to fly and obtained their license during the last three years. Thus it would seem to work out that, because of the fact that March 31, 1930 transport license registrations total 4507, a mere 450 of the innumberable persons who took up flying three years ago, or since that time have been able to get in the necessary 200 hours and obtain a transport license. And of that number, a considerable fraction would have got in most of their flying time in the military services as reservist students, not in commercial flying.

As regards the number of transport pilots owning their own planes, we find that of the total only 23 per cent claim to be that fortunate. However, here again the item of incorrect understanding of the questionnaire may come into play. Undoubtedly, in any event, most such machines are owned for commercial reasons.

Once a man secures his transport license he seems to continue with flying as a means of earning his bread and butter. At least the survey indicates as much, for of the total transport pilots who answered the questionnaire only 16 per cent are connected with the industry in a non-flying capacity. And contrary to the private pilots, of whom 46 per cent are not connected with the aero industry in any way, only 5 per cent of the transport license-holders replying are outside of the industry and the military services.

The solo-time and length-of-flying breakdown for transport pilots is as follows:

Flying 1 year or less	None
Flying 1 year to 3 years	10 per cent
Flying 3 years to 5 years	15 per cent
Flying 5 years to 10 years	25 per cent
Flying over 10 years	50 per cent
Solo time of 500 hours or less	9 per cent
Solo time of 501 to 1500 hours	33 per cent
Solo time of 1501 to 3000 hours	33 per cent
Solo time of 3001 to 5000 hours	15 per cent
Solo time of over 5000 hours	10 per cent

GREATER *Sales Effort* NEEDED

The Business Market is Ready for Development But Customers Must Be Supplied with Accurate Cost Figures

By C. H. BIDDLECOMBE

THE AIRPLANE INDUSTRY has now reached the situation common to many industries in this age of mass production—a condition which may be summed up as excess of production facilities over immediately apparent sales outlets. A newer and more efficient method of selling is needed for the future, if the factories are to be kept on full time and in a position to pay dividens on the capital so freely raised in the past two years. With a few brilliant exceptions, real selling ability is rather noticeably absent in the aeronautical industry; the great majority of salesmen are reasonably efficient in preaching to the converted, but are still very inexperienced in converting the heathen.

The chief activity of many salesmen has consisted of demonstrating a particular make of airplane to a customer *who had already decided to buy an airplane;* the salesman's job thus being chiefly to convince the prospect of the superiority of his own product in comparison to that of a rival firm.

Today this type of customer has disappeared together with the happy days when factory extensions could be financed from the funds on deposit, and it is questionable whether they will ever reappear. The "easy-to-sell" market of 1928 and early 1929 was composed largely of newly formed air mail and passenger lines, old established lines renewing obsolete equipment, flying schools, and private individuals profiting from the bull market in securities. Comparatively few airplane purchases were made by business firms and individuals for the purpose of transporting men and material from point to point as a matter of every-day business routine.

As a result of this narrow restriction of sales outlets —narrow in comparison to production capacity—there were between five hundred and one thousand airplanes left unsold to an ultimate user at the close of 1929; this is between 9 per cent and 19 per cent of the year's total output of 5,357 commercial airplanes.

It is probable that in 1930 the flying schools will in most cases be fully equipped by reason of their past purchases, the transport lines will have at least enough and even a surplus of planes, and the purchase of airplanes as luxuries will be unimportant.

There thus remains the sale of aircraft on the basis of their use to provide more efficient means of transport for business purposes; efficiency in this case being translated in terms of dollars and cents. It is in this direction that much energy and intelligence can profitably be expended by distributors and dealers, assisted by the sales promotion organizations of the factories.

The territory of every distributor and dealer should be divided into sections of suitable area or type and the responsibility for each section placed with an individual salesman. This man should then make a careful study of the business houses in his territory, selecting those engaged in type and volume of business that involves much travelling by employees. Then estimates can be obtained as to the extent and nature of the trips made by travelling employees and the cost over a given period of time when covering a given area of territory. The next step is of course to study the possible application of an airplane to the travelling carried out and to prepare cost figures showing the expenditure needed by any particular firm in sending its personnel on journeys in a company-owned plane. It is at this point that the majority of airplane salesmen fail to deliver the goods; very few of them have any really definite figures on operating costs over a long period, of the airplane they are trying to sell.

ACCURATE INFORMATION on this subject is obviously of prime importance to a prospective purchaser who has to be convinced of the advantages of using an airplane for business reasons. Published figures appearing from time to time are very baffling and misleading to the lay mind, ranging as they do from an operating cost of $0.06 per mile in the catalog of one manufacturer up to over $1.00 per mile according to one of the air mail contractors. It is thus imperative that a prospective investor in airplane transportation should be presented with a complete statement regarding his investment, showing the *cost to him* of operating a particular airplane under conditions governing its use in his case.

A carefully organized widespread canvass of the type described, based on the local individual salesman or dealer having reasonably complete and accurate knowledge of local conditions and airplane operating costs, will without doubt produce an important volume of sales. The selling has to be done, however, in the customer's office with concrete facts and figures, rather than out at the airport after a good lunch on a fine flying day.

Mechanics of Aero Corporation of California servicing a Pratt and Whitney "Wasp" engine

Equipment FOR

Tools and Machines Necessary to

By ERNEST W. FAIR

NEXT to the problem of making the institution pay, perhaps the most difficult of present problems relating to aircraft service stations is economically equipping the station to permit the greatest possible service.

Too much space and too little space can be utilized in a service station. However, the size of the station must be decided before one can even consider equipment. And in deciding the size the operator had well consider just what sort of service he is going to give. If he is going to make his service complete in every respect he should provide the largest possible space for his organization.

One cannot completely overhaul a plane in the same space and with the same equipment that one can perform a small service job on the landing gear or the wings of a plane. Nor can one perform complete engine overhaul (where the greatest revenue will come in) in the same space that one can adjust the timing valves on the same engine.

For the purposes of this article we had best divide service station equipment into three classes. First, the "super" service station which would provide for practically all overhaul and service; second, a service station of moderate investment and providing merely the same proportionate service to customers; and third, the ordinary service station, equipped to make minor overhauls and repairs and perform quick service operations.

After having decided the space needed for the station let us take up the general equipment and lay-out before considering specific tools. Any station that is to give the maximum performance must provide an "in-line" service, i.e., a service which progresses along a definite line, from the point where the plane enters the line to where it emerges complete and ready to fly. The arrangement of this system depends on the type of housing arrangement but in general a large hangar-type station arranged so that repairs can be made "in-line," can be outfitted in 150,000 sq.ft. or less. The more space and equipment the greater number of planes the department can handle. Consequently it is impossible to fix any limitation on floor space. However, the systematic arrangement of equipment can be so perfected that service output can be flexible. Flexibility is a point the operator should well consider so that he may be able to handle peak time service and at the same time not have a loss incurring during off periods.

Surveys have shown that the successful station should be equipped first, with a flexible "in-line" system of service. The plane enters at the start, the engine and wings are removed from the fuselage, as named, and the fuselage is sent on down the line while each of the two auxiliaries mentioned are repaired in their separate departments. Landing gear follows; then controls; fuselage itself, then controls back on again, etc.

The use of an I-beam overhead rail crane is of great importance in an aircraft service station. This may be situated on a circular track running the outskirts of the hangar or building. Or it may be a single track in the center of the building upon which members may be transported. It will be found that such a system is highly effective, and supplemented by a few stands and dollies will prove an immense time saver and aid for efficient assembly and disassembly.

Ample headroom should be provided throughout the structure and particularly at the beginning of the disassembly line when the engine is taken from the plane. Hoisting devices may be used auxiliary to the center rail hoist and crane (as we have been calling it) or may be dispensed with. However, a medium sized hoisting device will prove well worthy of the investment required and will be valuable in aiding speedy production and service. Tools and equipment should be so placed that service mechanics will have ample space to work in, and so that any number may work simultaneously on an individual plane. This means cost saving and faster work during times when the organization is crowded to capacity; a factor, if considered beforehand, will save much worry.

IF COMPLETE overhaul and repair is to be given, sand blast pits or rooms should be provided and these should be situated close in disassembly line immediately after wing and engine disassembly, and following the stripping of all detachable parts from the fuselage. These rooms need not require over 500 sq.ft. of space for a medium sized plant.

An individual section of the station, directly in the

THE AIRCRAFT SERVICE STATION

the Efficient and Profitable Operation of the Small or Large Service

disassembly line and so situated that it is directly in vertical line with a corresponding assembly position may be utilized for wing work. This should be located in proximity to the engine disassembly and assembly section. Wing repair, fabric and dope equipment and a paint booth should be provided. Every effort should be made to insure correct and ample ventilation for the paint booth or booths. Drying booths must not be overlooked. The wing shop should contain wood-working machinery to manufacture all necessary wood parts for repair and replacement work.

After the parts have been removed from the fuselage it is advisable to have them sent to a cleaning shop and if this is complete, both chemical and mechanical means should be at hand for cleaning, for removing grease as well as old paint. The mechanical method which consists of sand blast and wire brush is generally recommended.

Bake ovens and drying racks might well be considered as additional equipment for the painting and doping department, particularly for fuselage work. After a fuselage is removed from the paint shop it is advisable to have the next section in line be an overhaul shop. Then after these repairs have been made and a complete overhaul given the fuselage structure its return to the paint shop for final coating can speed up operation.

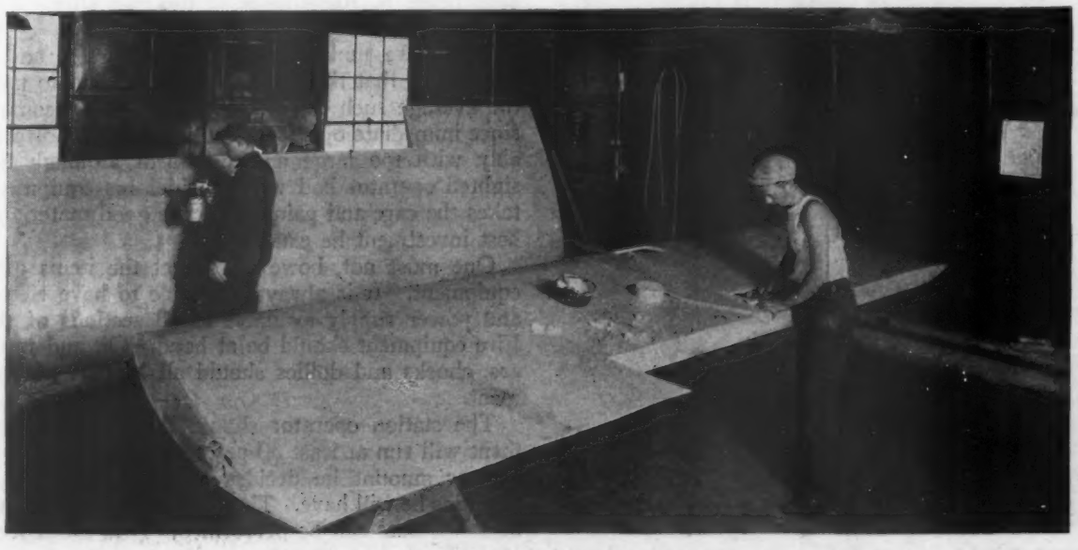
It is advisable in planning the assembly part of the station to bear in mind that extra room is advisable. Some successful stations have twice as much floor space for assembly as disassembly, not only to insure speedy and complete work but to insure perfection so that no overhaul job need be sent back for working over (which will eat up profits).

If a complete station is to be had, equipment had best be considered for every individual requirement so that a perfect job may be secured. Equipment is necessary for power plant installation, electric wiring, metal fabricating, heat treating, a forge, toolmakers' machinery, tank testing, etc. If heat-treating is to be used it is necessary to install an electric air furnace and molten salt baths with both oil and water quenching tanks.

Repair of control cables, with sufficient reserve supply to perform this, should be considered as well as a propeller balancing stand and tools for setting blade angles and checking track on propellers.

The cleaning equipment used in the overhaul plant should be carefully chosen and laid out. Two large pressure and blast machines each fitted with two hoses and capable of blasting all paint from any fuselage frame will be sufficient for almost any civilian shop.

The increased use of metal plane coverings and the trend in that direction in the future should be taken into consideration, and tools provided for such operations. Soft wire brushes for cleaning thin gauges of duralumin



Touching up control leads and doping a recovered wing

should be used. Grinders or buffers, a few electric or pneumatic hand grinders, fitted with wire brushes, will come in handy for cleaning parts too large to be cleaned otherwise. Several brushes with long flexible shaft drives will be found convenient for removal of paint from very thin metal wing ribs. Wire brushes for cleaning out of struts of round or streamline tubing, used like ram-rods, will also prove efficient.

Table I gives in brief a list of tools that should be on hand at any service station, no matter what its size may be. Necessarily a large station will need a greater quantity of tools, the quantity depending on the size of the station. It is highly advisable to start with the list given and amplify it after it has been ascertained what one's individual conditions will need. This is the safest and most economical method as most of these tools may be had at any automotive jobbing house.

To this list can be added many other small equipment materials, each adapted to a single task and most of which are self-explanatory.

Such additions would include carpenters' small tools, benches, jointer, planer, fuselage jigs or benches, wing jigs or benches, electric hand drills, glue pots, a steam box, sewing machine for fabric work, portable vacuum cleaner for fuselage work, radiator testing equipment, sheet metal workers small tools, soldering iron heater, small sheet metal beader and profile cutter, cable terminal wrapper, hard wire loop bender, wire and cable proof loader, pipe bender, atecylene welding set, power hacksaw, vertical drills, power grinders, wheel repair stand or stands, dihedral checking level, two-way builder's level, wing panel trailer, engine overhaul stand, chain block or blocks, special tools for each type of engine, small arbor press, kerosene washing pans, ignition-testing set-ups, piston and rod alignment jibs and straightening tools thereof, valve-truing tools, main bearing line reamer, a compressed air system for cleaning parts with bench hoses, gear pulling clamps, piston and rod scales, screw-cutting lathe, stationary oil can with faucet or pump and an engine test stand.

The complete shop may find use for machine and toolmaker's tools for the machine shop, if one is used; one ½ in. bolt screw machine; one universal turret lathe with 3 in. bar stock and one with 2 in. bar stock; eight engine lathes, four 14x16 in. and four 12x6 in. in size; one 12 in. speed lathe for brasses; six plain milling machines of various sizes; three 16 in. shapers; one small size key seater; one small horizontal boring mill; one 16x12 in. engine lathe; one 24 in. engine lathe; one 24 in. drill press; six No. 1 Morse taper drill presses; one power hacksaw; two universal cutters and grinders; one drill grinder; one surface grinder; two wet grinders; two emery ginders; one electric heat treating furnace; two arbor presses; one radial drill; one Brinell and one Rockwell hardness testing machines, and one tensile testing machine.

Table I: Primary Small Tools Used for General Maintenance in the Aircraft Service Station Shop

1 anvil. Size depended on station. Not less than 100 pounds.
2 blow torches of standard and reliable maker.
2-5 hammers of different kinds, rubber, lead, 10-in. sledge; 21-lb. engineers.
2-4 Yankee screwdrivers.
2 rachet screwdrivers.
2 center punches.
1 keyhole saw 12-14 in.
2-breast drills, chuck 0 to ⅜ in. or thereabouts.
6 24 in. x 16 in. steel square.
2 reciprocating hand drills with countersinks.
6 tack hammers, 2 each of 6, 12 and 20 ounce size.
2 combination pliers.
Ample supply of files, preferably at least a quarter and best a half dozen each of 14 in. flat mill; 14 in. bastards flat; 10 in. round; 14 in. half round bastard; 10 in. flat bastards; 10 in. half-round bastard; Several round shank twist drills of various sizes. At least a half dozen of each size 1/16-½ in. is recommended.
Several C-clamps, preferably two each in 6, 8 and 10 in.
6 48-in. bench clamps.
4 soldering coppers, one and two pound.
1 10-in. sweep ratchet brace.
At least two expansion wood bits; one ½-1½ in. and the other 1½-3 in.
1 10-in. dividers.
1 adjustable mitre box and stiff-back mitre saw.
1 26-in. rip saw; 1 26-in. crosscut saw; 1 24-in. fine-tooth veneer saw.
3 hack-saw frames and at least 24 10-in. 18-tooth hack-saw blades.
1 10-in. draw knife.
1 6-in. coping saw.
Various small rivet sets.
1 bench emery-wheel grinder.

This is the equipment recommended by Lieut.-Comdr. Lawerence B. Richardson of the San Diego Naval Air Station.

There are numerous other small items and various accessories that the station might well put to use but on the average such completeness is hardly recommendable since immediate operation could not be performed profitably with too large an investment although the foresighted operator had well consider his equipment, if he takes the care and pains to secure good materials, as the best investment he can make.

One must not, however, forget the items of general equipment. It is always advisable to have electric light and power supply available to all sections of the shop. Fire equipment should be at hand. Oil and water heaters, chocks and dollies should all be part of the equipment.

The station operator should consider that his equipment will run at least 30 per cent of his total cost. The greater amount he decides to put into it the greater facilities he will have. The more facilities for service the more services can be performed. And the more service business the greater the profit possibilities.

Inspecting a wheel just removed from a second hand plane

THE NEW *Air Mail Law*

A Most Timely Explanation of the Workings of the Waters Act

By BRICE CLAGETT
McAdoo, Neblette and Clagett

IT IS unquestionably true that air transport companies—existing and projected—have seldom been so disturbed as they are now over the interpretations which may be given by the Federal Government to the new Air Mail Law and, as a result, it appears almost inevitable that further amendments to the law will be proposed in the not distant future.

The solution of the questions at issue have a very direct bearing on the immediate future of air transport, for the reason that the great majority of air transport companies which have no air mail contracts are running in the "red" so consistently that all, or practically all, of them are struggling either to get air mail contracts for themselves or with companies associated with them.

The radical reductions in passenger rates inaugurated some months ago by a number of the air transport lines, are still experimental, but there is nothing yet to indicate that passenger caryying alone will make the lines profitable until operating costs have been further greatly reduced and the riding habit of the public by air has been further greatly increased.

Air mail, when transferred from government-operated lines to private transport companies had the threefold object of (1) affording the speediest possible movement for "rush" mail; (2) proving the reliability in all sorts of weather of airplane transportation; and (3) giving financial aid to enterprising air transport companies.

Up to the present time the first two objectives have been highly successful. Through the action of the Postoffice Department in opening up new air mail routes rapid progress has been made in furnishing air mail facilities to a rapidly extending proportion of the United States. The miles of mail airways at the end of 1929 were nearly double the miles being flown at the end of 1928 and nearly four times as great as the miles flown at the end of 1927. (7,832 miles December 31, 1927; 14,561 miles December 31, 1928; 26,597 miles December 31, 1929). The mail actually carried showed an even greater relative increase, the figures being 1,654,165 lb. in 1927; 4,063,173 lb. in 1928 and 7,000,700 lb. in 1929. In addition, the regularity and dependability of the air mail service has become a byword and this record doubtless has encouraged many of the people to begin flying.

The financial results to the air transport companies in general, however, has not been commensurate with the other benefits. The reason for this is shown by a glance at the United States air transport routes as pictured in the Air Commerce Bulletin of the Department of Commerce for March 1, 1930. Out of 96 routes listed in that schedule only about one-half—or 49—carry the mail and out of the 49 carrying the mail considerably less than one-half—or 18—carry passengers as well. In general, the mail routes have been financially very successful because of the high rates for air mail paid up to the present. Also, in general, and almost without exception, the passenger routes which do not carry mail have been financially very unsuccessful. Of course, in making such comparisons some allowance must be made for the relationship between some of the companies classed as mail carriers and some classed as passenger carriers, and also for the fact that on some of the mail routes which must be flown at night, passenger carrying is so far impracticable. The outstanding fact, remains, however, that there exists a large number of highly important passenger carrying lines which continue to lose money partially because they have no air mail contracts. For them the problem is largely whether they can keep their heads above water until lower operating costs and more passengers can be obtained or whether they will be forced into consolidations with lines having air mail contracts.

As is generally known, until the passage of the new Air Mail Law, air mail contracts were awarded entirely as a result of competitive bids and payment was made strictly on a poundage basis; the average income of the companies per mile for contract mail having been $2.01 for the year 1929. A number of previously awarded contracts expired during the Spring just past and it was this situation which was in a large part responsible for the revision of the air mail law.

BUT, there appear to be several features of the new Air Mail Law which promise to give rise to endless disputes and whether the existing situation will be improved can not yet be determined.

Primarily the new law theoretically continues the system of bidding for contracts, but one primary question is as to whether this theory will be carried out in practice.

There are four principal provisions of the new Law:

1. The Postmaster General is authorized to award to the lowest responsible bidder contracts for carrying the air mail at fixed rates per mile for "definite weight space" at not to exceed $1.25 per mile, the law providing that "one cubic foot of space being computed is the equivalent of nine pounds of air mail." It will be noted that the decision as to the amount of mail to be carried at not to exceed $1.25 per mile was apparently left entirely to the Postmaster General and until regulations under the new law are issued it is clear that the air transport companies will not know what the result of them is to be.

2. Where the air mail moving over a route does not exceed 25 cu.ft.—or 225 lb.—the Postmaster General

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may award a contract at a rate not to exceed $0.40 per mile for such weight space to the lowest responsible bidder "who has owned and operated an air transport service on a fixed daily schedule over a distance of not less than 250 miles and for a period of not less than six months prior to the advertisement for bids." One serious difficulty to this provision promises to be the interpretation of the phrase "fixed daily schedule." A large number of passenger carrying lines have been operated over routes and for the period designated but only on a six-day a week schedule and the question is bound to rise whether six days a week means "daily." The object of this provision, of course, is to give the preference to those who have pioneered in the air transport service.

THE CHIEF DIFFICULTY of interpretation, however, which promises to arise from this provision is based upon differences of opinion as to the cases in which it can be applied. Some of the prospective bidders have assumed that the clause means that where a company has been operating on a daily schedule for six months over a particular route and bids are called for over that route such company would be given the preference. They have been surprised to learn, however, that a radically different interpretation to the clause is being given in some responsible quarters; namely, that the clause means that when a company has been operating on a daily schedule over *any* route in the United States for more than six months, such company will have the privilege of bidding for any route advertised. In other words, under this reading of the clause, it is urged that if a company has been operating, say in the middle-west under conditions laid down in the Bill, it may bid, if it desires, for a New England route, giving up, if it desires, to another company its middle-western route.

It is probably too early to predict which interpretation will be adopted. It seems certain that both will be urged upon the Postoffice Department, with probable appeals to the Comptroller General and to the Courts.

3. A highly important provision of the new law is that under which the Postmaster General in his discretion may issue a route certificate up to ten years to an air mail contractor who has operated successfully for not less than two years. The result of such a certificate would be to give a monopoly, during good behavior, to a carrier for transporting the mail over the route indicated at rates to be fixed by the Postmaster General at not to exceed $1.25 per mile.

4. The provision, however, of the new law which promises to give rise to the greatest amount of controversy is a new section reading that "the Postmaster General when, in his judgment, the public interest may be promoted thereby, may make any extension or consolidation of routes which are now or may hereafter be established." Exactly what this means no one connected with the enterprise appears to know exactly. Undoubtedly it will have to be clarified first by the Comptroller General, and probably finally by the Courts.

Possibly an illustration will make clear the implications in this provision of law. On one of the routes which has been approved by the Interdepartmental Committee, but where an air mail contract has not yet been awarded, one company claims to have operated a passenger service for more than six months on a daily schedule and, therefore, claims that under the new law it has a preemptive right to get the contract for the mail over the route in question. Operating into one of the terminals of this route and extending to another city practically at right angles to this route is another company which has carried the air mail but no passengers for a considerable time. This latter company claims that the Postmaster General should "extend" its route under the clause in question over the route covered by the first line. This particular route covers more than 600 miles and the company carrying passengers over the route contends that to call a 600 mile long line an "extension" is ridiculous.

Again, and as a result of this clause in the new Air Mail Law there have been repeated conferences, between practically all of the air mail carriers, in Washington, discussing "consolidation of routes." Obviously the object is, by the use of this clause and the use of the clause giving the Postmaster General the right to issue ten year route certificates, to avoid, as much as possible, competitive bidding which is uncertain, unsettling to the business and, to a certain degree at least, uneconomic.

This situation makes pertinent an inquiry, already agitated, as to why the theory of competitive bidding for air mail contracts is continued. The practice has been out of vogue for many years for railway mail. As I have pointed out in another place (Air Transportation and its Legal Problems, AVIATION March 29, 1930) all railroads are declared by law to be post roads and required to transport such mail matter as may be offered to them by the Postmaster General under conditions and regulations prescribed by him and at rates fixed by the Interstate Commerce Commission. Only in special cases, requiring higher than the average rates, are special contracts made with the railroads and it is specifically provided by law that the Postmaster General may enter into contracts for carrying the mails with railroad companies without having bids therefor.

The carrying of the mails by the railroads is altogether a question of service. A railroad carrying the mail between specific points continues to carry the bulk of it until another railroad operating between the same points establishes better service and better schedules. For example, the New York Central Railroad and the Pennsylvania almost monopolize the railway mail service between New York and Chicago because they began it many years ago and have continued to meet the competition. For a railroad to take mail service away from another railroad, it is not sufficient that it offer to give equal service. It must give better service! Routes, schedules and other features of service undergo constant day by day and year by year study by the Postmaster General—or the Postoffice Department—and as a result it can hardly be disputed that the railway mail service of the United States is the most efficient in the world.

THE QUESTION is, therefore, why the same general system should not be applied to the air mail; that is, why every air transport company operating on regular schedules over fixed routes should not be potential air mail carriers and why the one giving the best service within the judgment of the Postoffice Department should not carry the bulk of the mail over that route.

Of course, this means that a large amount of discretion would have to be left in the hands of the Postmaster General but this discretion has been exercised for many years in the case of the railroad mail without the check of competitive bidding. One result of the present system may be trading in bidding and the impossibility of persons operating air transport companies, or contemplating such operation, knowing whether or not they will get the benefit of carrying the air mail.

Racing Seaplanes . . .

By JOHN S. KEAN
Project Engineer
Naval Aircraft Factory

PRESENT AND FUTURE

The Last of a Series of Three Articles, Which Includes a Discussion of the General Program and Estimates the Necessary Financial Outlay

NO RACING PROGRAM can be expected to be successful if limitations are placed on the time available for development or if the project is inadequately financed. The British have on several occasions refused to enter planes which were not thoroughly tested in time for the race. It is apparent from the success of the recent British racers that such policy is conducive to reasonable development and that the decision to hold contests at two year intervals has in no way retarded progress. Apparently, if satisfactory progress toward the supply of a suitable engine has been made, the shortest time in which a plane may, with reasonable expectation of success, be developed, is one year.

The construction of the training racing plane should be expedited so that it is available for training of pilots as early in the program as possible. It should, preferably, be completed before the design of the actual racer is initiated since, in such case, the results of the flight tests may be of value in the construction of the racing planes. Since, however, this ideal condition will probably never obtain, the best solution would require that the training plane be placed in operation as early as possible, and used to amplify the data obtainable from wind tunnel and model basin tests.

As soon as possible, thereafter, the experimental racer should be produced. This plane should be used to obtain data regarding the water performance and characteristics of the type and to test the performance of the power plant and accessories.

THE initial tests should consist of the normal beach tests for checking the performance of the engine. After this has proven to be satisfactory the plane should be launched, without power, and towed at various speeds under various wind and water conditions. Towing cross wind and in rough water should furnish especially valuable information. The plane should then be anchored at a buoy under conditions approximating the most unfavorable that can be expected to obtain during the race. This test will furnish information regarding ability of the plane structure to withstand damage while exposed to the ordinary hazards of wind and water experienced in actual racing procedure.

Upon completion of the non-power tests the plane should be launched under power and thoroughly tested, at first, while taxiing at slow speeds and then at increasing speeds up to slightly below take-off speed. Take-off should, however, not be attempted. These taxiing tests should be carried out under various wind and water conditions, in order that complete data regarding water characteristics may be obtained.

In particular it is important to discover whether or not spray, thrown over the wings, is a serious problem,

The Mercury Racer of 1929 which was to have been flown by Lieut. Alford J. Williams

whether "water beating" of the propeller is present and whether the plane assumes planing and take-off speeds within such time as will indicate that a propeller efficiency sufficient for take-off may be expected in the actual racing plane. All these features are important and, if discovered too late in the constructional program, might easily present problems of sufficiently serious nature as to be unsolvable within the time limits then available.

This plane should not be flown. When the water performance has been established by thorough tests and sufficient operation of the power plant has been obtained to establish beyond reasonable doubt that this installation will function properly the engine and all equipment should be removed and the complete structure of the plane subjected to sand loading tests to confirm design strength calculations.

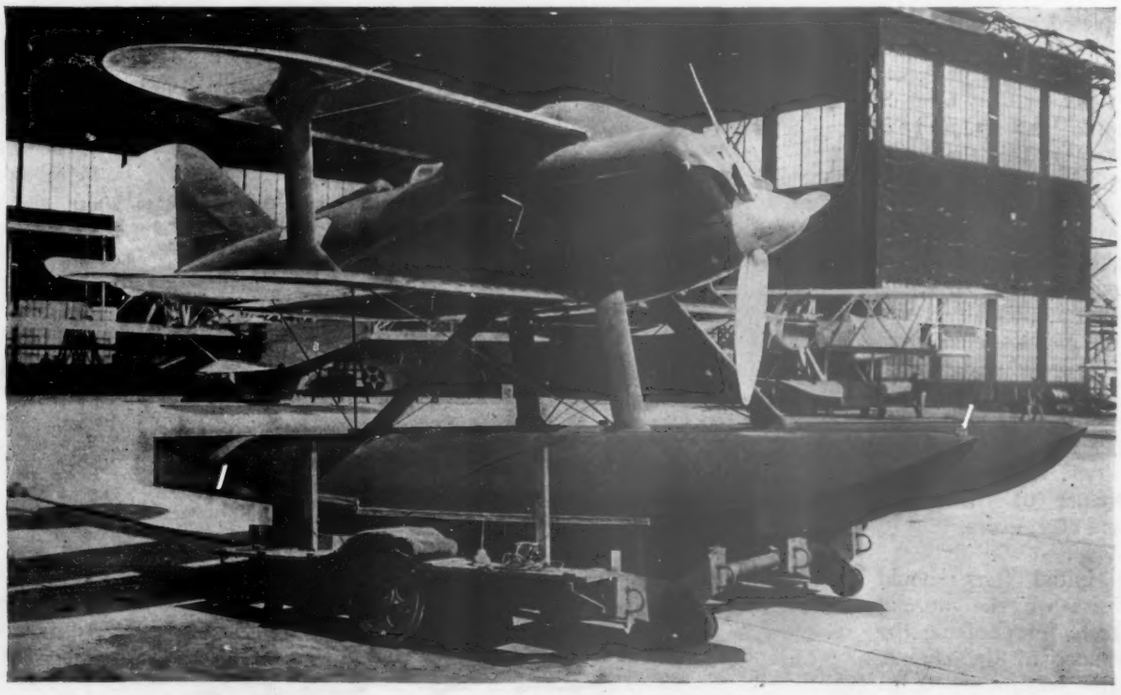
Upon completion of these tests and examination of the engine used in this experimental racer, the designer will be in excellent position to improve the actual racer or racers in any respect found to be unsatisfactory, will be able to save weight by reducing the size of members where the latter have been found by sand loading to be over strong or heavy and to increase the strength where deficiencies in this feature have been discovered.

It is the experience of most racing plane designers that the successful operation of the power plant is the feature most difficult to obtain in a racing plane. It is a safe assumption that power plant installation which functions properly during prolonged taxiing and beach tests will also function properly in the air. Then, too, the damage to the engine is most likely to be caused by taxiing on the water since during such time the oil and coolant temperatures are least controllable because of the lack of sufficient air stream to carry the heat away and of the buffeting to which the whole structure is subjected while the plane is getting under way. It is reasonable to assume that defects of the power plant which become sufficiently serious to later force planes out of the race have their actual inception during taxiing. The prolonged taxiing to which the experimental racing plane will be subjected should bring such defects to the fore in such manner that they will be evident upon teardown and inspection of the engine and this without undue danger to the pilot or plane.

Taken all in all the writer considers that the construction and utilization of an experimental racing plane will be the heart of any future racing program and is well worth the considerable expense entailed by such a policy. If it is necessary for financial or other reasons to curtail a racing program the abandonment of the training racing plane rather than the experimental plane would be desirable.

NO DISCUSSION of a future program would be complete without consideration of the financial problems concerned therewith. The cost of development of successful engines of one of the types discussed herein is, of course, problematical but it seems reasonable that this cost should not exceed $100,000 for the first engine, after which subsequent engines could be produced for $30,000 each. The figure of $100,000 may therefore be accepted as one expenditure for engine development which must be made regardless of the number of actual racers finally produced. Similarly, the cost of providing the training racing plane, without engine, $80,000 (assuming that the original engine will be used in this plane), the cost of the construction and test of the experimental racing plane $90,000, and the cost of the engine for the latter, $30,000, are also expenditures which should be made regardless of the number of racers built. The total, $300,000, is therefore, in the following estimates, designated the "fixed charges." It is assumed, of course, that the racers are all of the same general type. If the latter condition does not hold, this fixed charge must be multiplied by the number of such types.

There are numerous reasonable combinations of numbers and types of planes which may be selected as the



The F2W built for the 1924 races which were, however, postponed

final racing team. Of these, the following may be considered representative and the most likely to be adopted:

Case (a) One racer with no alternate plane.

Case (b) Three racers, with one alternate plane (a total of four) all of same type.

Case (c) Three planes, of different types and one alternate for each type (a total of six planes).

One spare engine for each racer but no spare engines for alternates would seem to be a reasonable provision. For case (a) the costs of equipment should be approximately as follows:

Fixed charge	$300,000
Racing plane	50,000
Two engines (1 for use as spare)	60,000
Spare parts and equipment	20,000
Total material costs	$430,000

For case (b)

Fixed charge	$300,000
4 racing planes (3 entries: 1 alternate) at $40,000 each	160,000
7 engines (one for each of 4 planes and 3 spare engines) at $30,000 each	210,000
Spare parts and equipment	50,000
Total material costs	$720,000

For case (c), since three types of planes and presumably of engines are involved the fixed charges of $300,000 will be applicable to each type and the total fixed charge will be:

$$3 \times \$300{,}000 = \$900{,}000$$

Therefore for case (c)

Fixed charge	$900,000
6 planes (one racer and one alternate of each type) without engines at $50,000	300,000
9 Engines (one for each racer and 3 spares at $30,000	270,000
Spare parts and equipment	80,000
Total material costs	$1,550,000

The cost of training pilots, providing ground crew, and transporting planes and equipment and personnel to and from the scene of the race and their maintenance should be about $100,000 for case (a); $300,000 for case (b), and $500,000 for case (c), so the grand total of carrying out of the racing programs outlined would be:

Case (a)

Material and Equipment Costs	$435,000
Personnel, Maintenance and Transportation costs	100,000
Total	$535,000

Case (b)

Material and Equipment Costs	$720,000
Personnel, Maintenance and Transportation Costs	300,000
Total	$1,020,000

Case (c)

Material and Equipment Costs	$1,550,000
Personnel, Maintenance and Transportation Costs	500,000
Total	$2,050,000

These cost figures are believed to be conservative, although actual cost figures for racing programs of the past are not available. In any case, the figures mentioned are much lower than those quoted ($5,000,000) by the British and Italian governments for similar programs in 1929. It, therefore, seems certain that foreign expenditures for racing programs were much exaggerated.

IN THE opinion of the writer, the cost of the most pretentious program (case *c*) outlined herein and amounting to slightly over $2,000,000, is one which the aeronautical industry as a whole can well afford to expend with a reasonable hope of ultimate profitable return in publicity and technical information derived therefrom.

It seems reasonable to expect that the planes, military and commercial, of the next few years will reflect the influence of any racing development, in this country, just as the British are said to contemplate the design of military and commercial planes around the 1900 hp. Rolls-Royce engine of the S-6. In other features, such as improved body contours and improved cooling facilities, developed as a result of racing plane practice, are incorporated in commercial airplanes, an improvement of at least 10 m.p.h. in high speed without increase in low speed is by no means impossible but is, rather, a logical development. The effect of such improvement would be such as to absorb fully the cost of a racing program in the field of commercial aviation alone and within a few years, the profits in increased numbers of military contracts designed to obtain planes of improved performance derived from the racing program would be another item tending to reduce the costs to the aviation industry of a racing program.

It will be noted that the aviation industry has been assumed to bear the expense of a racing program. It seems certain that this would be largely true. However, there are other sources of financial backing, namely, the Government, the extremely large number of wealthy sportsmen of whom not a few are extremely interested in aviation, the rank and file of aviation enthusiasts and the general public. The degree of participation of any of these agencies in a racing program is, however, beyond the scope of this article.

However, it seems that with the resources of the country to draw upon some sort of financial combination adequate for proper backing of a racing program should not be impossible.

For inspiration, the aeronautically interested portion of the public can do no better than follow the lead set by the backers of the various defenders of the America's Cup in yachting circles. The defense of this most famous trophy of American sporting circles is an event of financial magnitude approaching the cost of competition in the Schneider Trophy Race but is a strictly "amateur" affair from which no valuable technical nor financial benefits are expected. How much more worthwhile is the competition for the aeronautical equivalent of the America's Cup, involving for the successful nation the potential supremacy in civil and military aernautics?

In conclusion, the writer again desires to emphasize the importance in the development of future racers of increase in the speed range of racing planes. Two of the principal avenues for improvement have, for the time being at least, been closed by the extremely high power requirements indicated for future racers and in the other case by the fact that wings for present day racers are already so small that future decrease in their size would result in only minor improvement in speed, and that at the expense of water performance and increased landing speed. Refinements tending toward reduced drag and greater speed range are, therefore, very much in order and would seem to be the goal toward which designers of the immediate future should strive.

GENERAL NEWS

HERBERT F. POWELL, *News Editor*

Kingsford-Smith Flies the Atlantic

Makes One-Stop Flight From Ireland to New York

NEW YORK (N. Y.)—Demonstrating convincingly the effectiveness and the flexibility of radio in air navigation and displaying again the reliability of plane and engines in negotiating long, hazardous distances, Maj. Charles Kingsford-Smith landed the Southern Cross, a rebuilt Fokker F-7 with three Wright J-5's, at Roosevelt Field, June 26. This was the climax of the first flight of an airplane from Europe to the United States, although the trip was broken by a halt at Harbor Grace (Newfoundland) Airport on June 25-26 for fuel, rest and improved weather conditions.

A feature of the flight was the constant employment of the radio wireless for communication with surface stations and for navigation through extremely thick weather. The radio operations served as the foundation for successful navigation under extremely bad conditions and these two, coupled with the reliability of the veteran Whirlwinds, made possible another chapter in the plane's circumnavigation of the globe which started 2 yr. ago.

Took Great Circle Route

The schedule maintained on the Europe-United States flight was as follows (in New York City daylight saving time): Took off at 11:27 p.m. Monday, June 23 from the beach of Port Marnock, on the east coast of Ireland, not far from Dublin. Cleared the west coast about 1 a.m. Arrived at Harbor Grace at 6:56 a.m. Wednesday, June 25. Took off for New York at 4:05 a.m. Thursday, June 26. The plane passed over Halifax about noon and Boston about 5 p.m. Landed at Roosevelt Field at 7:31 p.m., June 26.

A modified great circle course was followed over the north Atlantic and the crew appears to be convinced of the undesirability of this northern route for regular trans-ocean flying on account of the severe weather conditions. The machine took off from Port Marnock in a run of about 3,500 ft. Beside the crew of four, the radio apparatus and provisions there was a load of about 1,290 gal. of gasoline and 45 gal. of oil. The flying time was about 31 hr. 30 min.

Compass Trouble Encountered

It was interesting to note that the Southern Cross crew experienced difficulty with the plane's compasses within a few hundred miles of Newfoundland, an episode similar to that met by the crew of the Bremen in 1928. This magnetic disturbance may have an important bearing on further air navigation in that region and may account for failures in previous east-west Atlantic attempts.

Only enough fuel for between 3 and 4 hr. more flying remained in the tanks when the machine was landed at Harbor Grace. The course was about 2,190 mi. The 1,100 mi. between Harbor Grace and Roosevelt Field was flown in about 15 hr. 30 min.

The average speed crossing the ocean was only about 70 m.p.h. Head winds and, for about two thirds of the way, poor visibility which at times was dense fog, hampered progress. The average speed on the last lap to New York was about 70 m.p.h.

The Curtiss-Wright Corp. offered Kingsford-Smith before the start of the flight a new set of engines—three J-6s—in place of the old J-5s. He refused to make the substitution, however, and his faith in the veteran power plant was justified. The Fokker plant offered a new plane, also.

Flew the Pacific in 1928

The transmitter on the plane was built by the Heintz & Kaufman, Ltd., San Francisco, and is the same instrument carried on the trans-Pacific flight. With the tube, the set weighs about 10 lb. and occupies a space about 16x18 in. at the base and 8 in. high. It is a 50-watt self-oscillator, and operates on a wave length of between 600 and 800 m. A 30-lb., wind-driven generator is used.

With Kingsford-Smith was Evert Van Dyk, co-pilot; Capt. J. Patrick Saul, navigator; and John W. Stannage.

Kingsford-Smith took off from the Oakland Municipal Airport, accompanied by three companions, on May 31, 1928, for the flight across the Pacific. The party reached Hawaii in about 27 hr. 28 min. and after refueling and rest reached Suva, Fiji Islands, in a flight of about 34 hr. 33 min. Refueling and rest occupied but a few days here and the party pushed on to Australia, arriving there on June 9, after about 21 hr. 18 min. of flying. The entire route was 7,800 mi. long.

Plane's History Described

In the summer of 1929 Kingsford-Smith took off for England from Australia and the plane was forced down in the northwestern part of that continent, causing an extended aerial hunt which resulted in several unpleasant episodes. Kingsford-Smith made another start in July, 1929, and reached England in the fast time of 12 days, a record for that trip. The plane later was placed in the Fokker factory in Holland where its covering was reconditioned and control surfaces were adjusted.

The plane was turned out by the Hasbrouck Heights plant of the Fokker company in 1926 and sent to Alaska. It was used by Capt. Sir Hubert Wilkins until it crashed and the wing was used on a Fokker Universal fuselage, until this machine also crashed in Wilkins' service. The two damaged machines were brought back to this country in 1927 and the wing was replaced on the repaired F-7 fuselage. After being used in transport work for a short period, it was acquired by the Kingsford-Smith interests.

[AVIATION departs in this case from its policy of silence regarding trans-Atlantic flights because of instructive facts involved in this particular instance, such as the performance of the radio and of the old J-5's attached to a rebuilt craft more than 4 yr. old.—ED.]

Miss Earhart Makes Woman's Speed Record

DETROIT (MICH.)—Flying a metal Lockheed-Vega over a 64-mi. course starting at Grosse Ile Airport, Miss Amelia Earhart on June 25 made an average speed of 174.9 m.p.h. She also made an average of 171.44 m.p.h. over the same course with a load of 500 kg. (1,100 lb.) in the plane, which was strictly a standard model.

These performances were checked by N.A.A. timers, and will therefore be eligible for homologation as feminine World and International Records by the F.A.I. No woman's speed record has yet been recognized, and an earlier mark set by Miss Earhart was unofficial.

World Records for women which have been homologated to date are: Duration, Mlle. Maryse Bastie (France), 26 hr. 47 min., in a Caudron monoplane with 40 hp. Salmson engine; Distance, Mlle. Lena Bernstein (France), 14,048 mi., from Istres, France, to Sidi Barabt, Egypt, in a Caudron monoplane with 40 hp. Salmson engine; Altitude, Miss Ruth B. Alexander (U. S.), 27,418 ft., in a Great Lakes Trainer with Cirrus engine. The Duration Record has been surpassed under official observation by Mlle. Lena Bernstein with a flight lasting 35 hr., 46 min., 55 sec. in a Farman plane with 230 hp. Salmson engine, but this record has not yet been homologated.

Winnipeg Club to Stage Meet

WINNIPEG (MAN.)—An air meet will be staged on July 15 by the Winnipeg Flying Club in which members of Saskatchewan and Alberta clubs are expected to participate. St. Paul fliers have been extended an invitation to attend the affair in return for the visit made to that city by a delegation of Canadian fliers on May 24, the occasion of an air meet there.

Flies to Bermuda And Return Non-Stop

Roger Williams Employs "Columbia" in 17 Hr. Trip

NEW YORK (N. Y.)—Again brought from its hangar, the Whirlwind Bellanca "Columbia," veteran of Chamberlain's flight to Germany, was flown non-stop from Roosevelt Field, L. I., to Bermuda and return on June 29 by Roger Q. Williams, with Erroll Boyd as co-pilot, and Harry P. Connor as navigator. The flight, according to Williams, was undertaken "for the purpose of testing the commercial possibilities of a Bermuda airline and for testing the varying air currents over the Gulf Stream in a single day."

Bermuda was reached at 2:20 p.m. On arrival, Williams circled the colony for some twenty minutes, dropped a mail bag, then turned and headed back for New York. It was at the Islands that the only trouble of the flight was encountered, a rain storm area covering the Bermuda group. Rain leaked into the cabin, and most menacing of all, the magneto was affected. On the return, however, the rain area was soon left behind and the ignition unit again functioned correctly.

Flight Figures Given

The outstanding point of the flight was the handiness with which the fliers "hit Bermuda directly on the nose" employing Connor's calculations. Equally as efficient was the return flight, and thus some 100 gal. of fuel still remained of the initial 327 gal. when Williams and his companions landed at the Curtiss Valley Stream airport to complete the 1,560-mi. journey. Flying time totaled 17 hr. 1 min., with the take-off at Roosevelt Field at 5:02 a.m., Eastern Daylight Time, and with the return clocked at 10:03 p.m. The landing was made at the Curtiss port rather than at the take-off point because a slight haze obscured Roosevelt Field when the fliers returned from the British Islands.

The high credit to Connor, who is a Navy-trained navigator, is of course derived from the fact that the Bermuda group occupies a space but 18 mi. by 6 mi.—a small target for an over-water air venture of such a distance. Erroll Boyd, the co-pilot, is a flier of some 16-yr. experience and a veteran of the R.A.F.

Speed Averaged 100 m.p.h.

The only other flight from the United States to Bermuda was the attempted non-stop trip from New York, made by Alexander, Yancey and Bouck on April 1 in an Edo-pontooned Wright-powered Stinson-Detroiter, owned by the Pilot Radio and Tube Corp. of Brooklyn. This attempt ended some 60 mi. short of Bermuda when night fell, the fliers awaiting dawn on the calm sea and flying to their goal in the morning. (AVIATION, April 12, p. 768.) The Stinson may be said to have been better prepared for such a flight, since two-way radio equipment was carried and since the pontoons made possible a water landing and continuation later of the journey. The Columbia carried neither radio nor pontoons.

Head winds prevailed on the outgoing trip, but following winds obtained on the return. The 2,000-ft. altitude was employed for the flight; the speed average for the trip was in the neighborhood of 100 m.p.h. Dr. James H. Kimball, associate meteorologist at the New York Weather Bureau, had predicted good weather for the journey.

Genealogy Of "Aviation"

AVIATION was founded by Lester D. Gardner, the first issue appearing Aug. 1, 1916, as *Aviation and Aeronautical Engineering*. In 1920 the *Aircraft Journal* was absorbed and the title became *Aviation and Aircraft Journal*, to be simplified into AVIATION in January, 1922. The chief editors have been Ladislas d'Orcy, W. Lawrance Le Page, Earl D. Osborn, R. Sidney Bowen, Jr., and Edward P. Warner.

The present staff consists of Edward P. Warner, editor; R. Sidney Bowen, Jr., associate editor; Herbert F. Powell, news editor; Leslie E. Neville, technical editor; Earl D. Osborn, contributing editor; Charles F. McReynolds, Pacific Coast editor; John T. Nevill, Detroit, editor; Charles H. Gale, David J. Leisk, Charles E. Noyes, Henry O. Pattison, Jr., and Mitchell C. Hodges, assistant editors.

Canadian Forest Patrol Active

OTTAWA (ONT.)—Operations of the forestry branch of the Royal Canadian Air Force are reported to be under way at all bases in Manitoba. The bases, which have from one to four planes each, are established at Lac du Bonnet, Bergens River, Norway House, Winnipegosis, Cormorant Lake, and Thickett-Portage.

Test Todd Low-Wing Racer

PUEBLO (COLO.)—E. C. Burghduff, sales engineer of Chevrolet Aircraft Corp., has been supervising tests of a new racing monoplane powered with a Chevrolet D-333 four-cylinder, inverted, in-line, aircooled engine, rated at 100-hp. The plane, designed and built by Edgar B. Todd, is a single-seat machine, carefully streamlined.

HIGH POINTS in the NEWS

► *One-stop.* Maj. Charles Kingsford-Smith and three companions fly a Fokker F-7 from Ireland to New York, June 25-26, via Harbor Grace, where a refueling stop was made.

► *Non-stop.* Using the Bellanca trans-Atlantic plane "Columbia," Roger Q. Williams flew to Bermuda and back on June 29, in 17 hr. 1 min.

► *When-stop?* At this writing, Hunter Brothers are continuing their refueling endurance flight in a Wright-powered Stinson after breaking old record of 420 hr., made by Jackson and O'Brine.

► *Growing.* Aero exports for month of May, amounting to $1,391,159, is the highest figure for any 1930 month yet recorded.

Airports and Airlines

► *Inaugurated.* Pan American Airways starts 1,800-mi. northbound mail service along the east coast of South America; announces route and schedule changes.

► *Severe.* Fire of unknown origin does damage estimated at a million dollars to planes and hangars at Chicago Municipal Airport.

Foreign

► *Civilian.* King's Cup Race for British civilian planes, to be flown over a 750-mi. course on July 5, attracts 96 entrants.

Aeronca May Have Set Record

CINCINNATI (OHIO)—It is claimed that an Aeronca flown by Stanley C. Huffman has established a duration record for a closed course of 25 hr. 42 min. for light planes with single place and weighing between 200 and 500 kg. No record had been established in this performance before. A standard Aeronca fitted with extra tanks permitting a total of 55 gal. was used. The plane flew 1,271 mi. No statement about this record claim has been received from the N.A.A. as yet.

Gull Gets First Glider Approval

WASHINGTON (D. C.)—The first approved type certificate for gliders has been issued to the Detroit Aircraft Corp. for its primary Gull, a one-place, open cockpit, monoplane, having a span overall of 34 ft., a length overall of 17 ft. 8 in., a weight empty of 206 lb., a useful load of 170 lb., and a gross weight of 376 lb. Above weight values are reduced 12 lb. if the wheel type landing gear now employed by the craft, is removed.

Establish New Refueling Record

Hunter Brothers Still Aloft In Wright-powered Stinson

CHICAGO (ILL.)—Flying a Wright Whirlwind 300—powered Stinson Detroiter, John and Kenneth Hunter, Sparta, Ill., have established a new refueling endurance record and are still in the air as AVIATION goes to press.

The former mark of 420 hr., set last July 30, at St. Louis, by Dale Jackson and Forest O'Brine in the Challenger powered "St. Louis Robin," had been exceeded by one hour at 6:01 a.m. (Central Daylight Time), on June 29. The Hunter brothers started their flight from Sky Harbor Airport at 4:40 p.m., Monday, June 11.

Aiding the fliers in their venture are two other brothers, Albert and Walter, who pilot the refueling plane, another Wright-powered Stinson Detroiter, while a sister, Irene, prepares the food taken aloft for the record-breakers.

As in other refueling attempts in the past, fuel is taken into a storage tank in the cabin from where it is pumped by hand to the wing tanks. The "City of Chicago," as the plane is named, is fitted with a catwalk on both sides of the nose cowling so that necessary repairs can be made in the air.

(Information concerning the fuel consumption, number of refueling contacts made, difficulties overcome, etc., will be given in the July 12 issue of AVIATION News.)

Approve Five Planes, One Engine

WASHINGTON (D. C.)—Five planes and one engine have been added to the approved type list. The planes, according to certificate number, make and designation, type, power plant, weight empty, useful load, and gross weight are: No. 330-Boeing Monomail, one-place open monoplane, 575 hp. Hornet B, 4,626 lb., 3,374 lb., 8,000 lb.; No. 331-Kari-Keen 90, two-place cabin monoplane, 90 hp. Lambert, 1,014 lb., 534 lb., 1,548 lb.; No. 332-Ogden "Osprey," six-place cabin monoplane, three 90 hp. American Cirrus engines, 2,898 lb., 1,650 lb., 4,548 lb.; No. 333-Waco HSO, three-place open biplane, 225 hp. Packard R-980, 1,814 lb., 786 lb., 2,600 lb.; No. 334-Aeromarine Klemm AKL-26-B, two-place open monoplane, 85 hp. LeBlond, 1,016 lb., 565 lb., 1,581 lb. Approved type engine certificate No. 54 was granted to the Warner Scarab Jr., 5-cyl., radial air-cooled, with a rated horsepower of 90 at 2,025 r.p.m.

Offers Plane With Flying Course

SAN DIEGO (CALIF.)—A Great Lakes Sport Trainer and a transport pilot's course, both for $4,460, is the offer being made by T. C. Ryan Flying School located here.

Add 32 Names to Caterpillar Club

WASHINGTON (D. C.)—Since January 1, 32 names have been added to the official list of members of the Caterpillar Club maintained in the Information Division of the Office of the Chief of the Air Corps.

May Aviation Exports Highest for 1930 So Far

WASHINGTON (D. C.)—Aeronautical exports showed an increase during May, valuation of craft, engines, and parts reaching the highest yet reached in a 1930 month, totaling $1,391,159.

The largest rise was shown in planes. Fifty-eight machines valued at $867,918 were shipped out during May as compared with eighteen planes valued at $288,603 during April, and 27 planes valued at $425,688 during March. The valuation for May, 1930, was even larger than that for May, 1929, which showed 49 planes, worth $794,024.

Exports of engines continued a steady progress which they have shown during the spring months. For May 42 engines, appraised at $244,190, were exported. Twenty-nine engines, worth $109,324, were shipped out in April, and nineteen power plants, valued at $98,958, were exported during March. The figure for May, 1930, is more than double that of May, 1929, 24 engines valued at $94,315 being exported that month.

Aircraft parts and accessories, except tires, showed an export valuation of $279,051 for May. During April $134,234 worth of parts were shipped out as contrasted to $186,929 in March. The appraisal in this classification for May, 1929, amounted to $189,958.

The only classification showing an increase for the 5-mo. period ending in May, 1930, over the same period of 1929 is that of parts and accessories. While the valuation for the 1929 period was $846,510 that of the 1930 period has risen to $939,959.

During 1929 146 planes, valued at $2,435,070, were exported during the first five months, while 132 planes, valued at $2,042,223, were shipped out during the same period of this year. Exports of engines during the five-month period of 1929 amounted to 149 engines with a valuation of $718,455. During the same span of 1930, 128 engines valued at $609,175 were exported.

A table giving the figures for the leading foreign consumers of U. S. aero exports in April, when the value of planes, engines, and parts totaled $719,333, is given below:

Country	Planes	Value	Engines	Value	Parts
Netherlands	..	.....	6	$17,712	.....
Poland and Danzig	..	.....	..	.....	$2,160
Soviet Russia in Europe	..	.....	..	.....	37,646
Canada	6	$74,808	6	6,699	51,919
Panama	..	.....	4	16,117	5,794
Mexico	3	38,095	..	.....	2,189
Trinidad and Tobago	..	.....	2	15,000	6,517
Argentina	2	34,400	..	.....	6,195
Peru	3	80,300	1	6,480	2,158
Java and Madura	3	60,000	3	21,000	.....
Japan	..	.....	2	11,808	320
Hawaii	2	135,000	4	40,552	11,600

Six Civilian Aviators Undergo Army Tests

SAN ANTONIO (TEX.)—Six civilian fliers have just completed a two-weeks' preliminary test at Brooks Field, results of which will have an important bearing on future training of Air Corps personnel. The test just completed is one of a series of experiments being undertaken by the Army in an attempt to obtain facts concerning the possible correlation of civil and military air training.

If the results of the Brooks Field test are considered satisfactory the civilian fliers will be given the advanced flying course at Kelly Field. Only graduates of commercial Transport pilot flying schools were eligible for the test, the six who undertook it having been selected from eleven applicants.

Suggestion was made some time ago that preliminary training for the Army should be taken over by commercial flying schools, which were to be compensated by the Army for providing the instruction.

This idea was not accepted, but was probably effective in interesting the Army in proposing the set of experiments of which this is the first. After the data from the two-weeks' trial has been studied, other tests will be undertaken.

Military Fokker Nearly Ready

HASBROUCK HEIGHTS (N. J.)—A twin-engined reconnaissance plane of a "flying wing" type, is nearing completion at the Fokker plant, Hasbrouck Heights, N. J., reports state, and the craft will shortly be flown to Washington for tests before Army officials. Designed for long range operations at high altitudes and equipped as an observation plane with photographic and radio equipment, the machine's engines are faired into the wing.

Air Corps Orders 876 Engines

WASHINGTON (D. C.)—Army Air Corps has issued contracts for 876 engines, to cost a total of $5,336,559.59. Pratt & Whitney Aircraft Co. is to supply 684 Wasps and spare parts for $3,802,763.32, while the Curtiss Aeroplane & Motor Co. will furnish 40 D-12-E power plants and spare parts, and 152 V-1570 engines—to include some geared and supercharged. The Curtiss order is worth $1,533,796.27.

Make Route Change In All-America Derby

DETROIT (MICH.)—The route of the All-America Flying Derby, to be held in latter July and sponsored by American Cirrus Engines, Inc., has been altered, eliminating Mexico as a waypoint, according to F. R. Maxwell, Jr., president of the Cirrus firm. The change was made on the recommendation of Ray Cooper, in charge of the pathfinding party, and is due to unfavorable weather now existing in the southern Republic.

"The rainy season," said Mr. Maxwell, "now is in full swing in Mexico and it is likely to continue well into August. In view of the bad weather that is certain to greet the entrants should they fly into Mexico, we believe it is advisable to eliminate the Mexican leg from the route."

Under the original itinerary the pilots were to fly from Laredo, Tex., to Mexico City, and return before heading toward Los Angeles. The revised route will not touch Laredo and will reduce the derby's mileage by approximately one-thousand miles.

The derby will take off from Detroit City Airport on or about July 21 and proceed to Montreal, Que. From Montreal the fliers will proceed to New York, Atlanta, Ga., and Houston, Tex. Either Tulsa or Oklahoma City, Okla., will be visited next, after which will come Albuquerque, N. Mex., and Kingman, Ariz. From Kingman the pilots will fly to either San Diego, Los Angeles, or Oakland, Calif., before returning to Detroit via Salt Lake City, Cheyenne, Omaha, and Chicago.

May Be Held Annually

More than twenty-three aircraft manufacturers, Cirrus officials said, have either definitely entered or have signified their intention of entering the race, which is open only to planes powered by American Cirrus engines. Many builders are producing special craft to compete for the race's $25,000 in cash prizes.

If the first All-America Flying Derby is the success it is expected to be, American Cirrus Engines, Inc., may make it an annual event, it was said. Instead of starting from Detroit, however, the annual derby would leave from the Marysville Municipal Airport, development of which is now being pushed by the engine company.

The entries already received, in the order of their receipt, with the single exception of Tex Rankin who was second to enter, but who asked for No. 13 for luck, comprises:

No. 1 "The Little Rocket" a Command-Aire entered by the Little Rock Racing Association of Little Rock, Ark.

No. 2 Jack Barstow, San Diego, Calif., who will fly a Great Lakes Aircraft Corp. Speedster.

No. 3 C. W. Myers, Cleveland, Ohio—Great Lakes Speedster.

No. 4 Larry Brown, Los Angeles, Calif.—Special racing plane.

No. 5 LaSalle Peru Airways, Chicago, which has entered a machine of the E. M. Laird Air Line Co.

No. 6 Verne L. Roberts, Moline, Ill., flying a Monocoupe.

No. 7 B. B. Smith, Portland, Ore., flying a craft of the First National Flying System.

No. 8 Henry H. Ogden, Englewood, Calif., flying an Ogden Osprey.

No. 9 Swallow Airplane Co., Wichita, Kan., entering a Swallow.

No. 10 Ben E. Brown, Lawrence, Kan., flying a plane of the Allison Aircraft Corp.

No. 11 Elmer Dye, San Diego, Calif.—Name of craft not disclosed.

No. 12 John Livingston, Aurora, Ill.—Name of craft not disclosed.

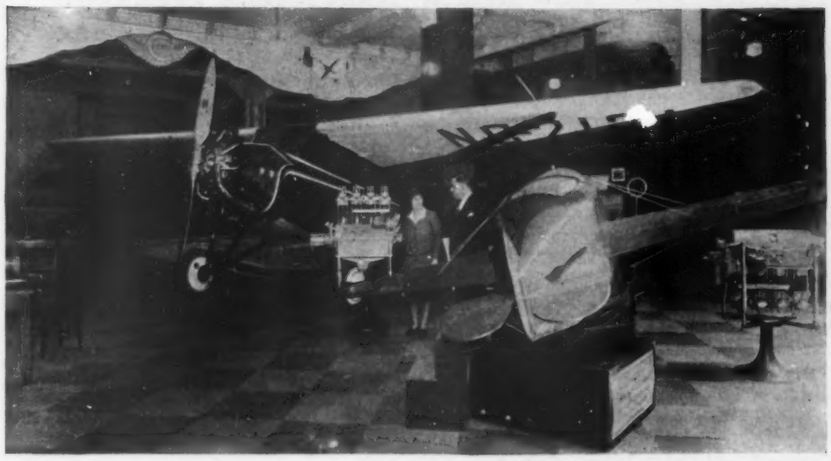
No. 13 Tex Rankin, Portland, Ore.—Name of craft not disclosed.

No. 14 Billie Tipton, Oklahoma City—Flying a machine of the Ranger Aircraft Corp.

No. 15 Parker Runyon of New Brunswick, N. J., flying a plane of the U. S. Aircraft Corp.

No. 16 S. T. Stanton, Wichita, Kan., flying a Cessna.

Join Automobile Row With an Aero Showroom



OPERATED JOINTLY by the C. T. Stork Corp., distributor, and Cassell Flying Service, dealer, both of New York, an airplane showroom has been opened at 1782 Broadway, New York City.

Above may be seen two American Cirrus engines, a Stinson, Jr., a Link trainer and, in the left background, Edo floats and a Great Lakes Sport Trainer. The exhibit also includes a Savoia-Marchetti S-56, a Lycoming 210 hp. engine, and an Irvin parachute.

Cassell Flying Service, of which Henry B. Cassell is president, is also a distributor for Bowlus gliders and soarers, and operates a flying school at Holmes Airport, Jackson Heights, N. Y., and a glider school at the New York City Airport, Flushing, L. I., N. Y.

Offers Powered Glider Engine

BURBANK (CALIF.)—A 5-cyl., radial, air-cooled, engine for light airplanes, developing approximately 13 hp. at 2,000 r.p.m. and weighing 65 lb. complete has been placed on the market by Dickinson-Brooks Aero Motors Co. here. Known as the D-5 "Sky Button," the engine is of conventional static radial type. It has a piston displacement of 49.8 cu.in., a bore of 2¼ in., stroke of 2½ in., and compression ratio of 5.5 to 1. The engine has successfully passed a long series of block tests and is now to be subjected to a destruction test at high speed.

Forty-seven Planes Fly in Nebraska Tour

OMAHA (NEB.)—The second Nebraska air tour, held June 23-28, was witnessed by an estimated 100,000 persons at the sixteen Nebraska cities and towns visited en route by the fleet of 47 planes.

Lieut. E. H. Beebe of Fort Riley, Kan., was flight commander, Eric Rogers of Omaha was tour manager, and Harry Sidles, Jr., of Lincoln, was chairman of the tour committee, composed of members of the Omaha, Lincoln, and Falls City chapters of the N.A.A., which sponsored the affair. The tour itinerary covered about 1,400 mi. Last year's tour, the first ever held in Nebraska, was made up of 29 planes and stops were made at thirteen towns.

One town was added to the previously announced itinerary, a stop being made at Friend, between Hastings and Omaha, on the last day of the flight. Other places visited were Lincoln, Niobrara, Norfolk, Long Pine, Valentine, Hay Springs, Alliance, Scottsbluff, Sidney, Ogallala, Lexington, Kearney, Holdrege, Grand Island, Hastings, and Omaha.

Four women made the tour. Miss Nellie Zabel Willhite of Yankton, S. D., piloted an OX-5 Eaglerock; Mrs. George Herte, of Wichita, Kan., accompanied her husband as co-pilot of a Whirlwind-powered Cessna, in which Faye Lucille Cox was a passenger, and Mrs. H. C. Noll of Omaha was co-pilot of a Travel Air, powered by a Whirlwind. Mrs. Cox gave parachute exhibitions at a number of the tour stops.

AERONAUTICAL FINANCE

By R. R. Doane

Weekly Comparisons

	Week Ended June 26	Previous Week	Same Week 1929
Aviation:			
Aviation stock averages	18.86	21.10	46.90
Number of stocks traded in (1)	48	49	64
Volume aviation share sales (2)	576,400	601,900	929,000
Ratio aviation share sales to total share sales (3)	1.66	1.89	3.22
General Market Data:			
Total volume share sales N. Y. Stock and Curb Exchanges	34,552,230	31,697,000	25,725,180
Railroad share sales N. Y. S. E.	930,910	525,140	1,032,480
Market averages (N. Y. Times)	204.26	217.23	256.97
New domestic financing	131,712,500	135,423,000	51,946,000

Notes—(1) All stocks actively traded in on both New York Stock Exchange and the Curb Exchange; also contains over-the-counter stocks on which bid and ask quotations are regularly published. (2) Total volume on both N. Y. Stock and Curb Exchanges. (3) Percentage of aviation stock trading to total volume of sales all classes of stocks on both exchanges.

Gross Revenues Improving

PRICE MOVEMENTS on the security exchanges have recently shown some relief from the previous pressure. Speculative sentiment appears more cheerful.

With an apparent poor showing made by the aeronautical industry during the first quarter, as compared with the exaggerated figures of last year, together with the notable lack of reassuring statements as to the total volume for this quarter, the air stocks have continued in the low area.

With the volume of new orders received by this industry during the past month in excess of 17 million dollars, coupled with an additional 2 million in exports since the first quarter, together with some 20 millions of unfilled orders on top of actual first quarter sales of 8 million and exclusive of the recent government contracts, it appears that on the whole the industry is not doing so badly and may yet stagger through with a substantial showing by the end of the year. Combined with this not altogether unfavorable outlook, recent airport construction programs involving current expenditures in excess of 8 million dollars are now nearing completion in some 26 municipalities.

Further, substantial increases in the transportation division have also proven quite heartening. The five major groups in this branch of the industry have realized increases in mail revenue during the first four months of the year as shown in Fig. 1.

During this period North American Aviation (Eastern Air Transport) has shown the greatest percentage increase both in poundage and in revenue.

All of this is brought out merely by way of pointing to the still considerable volume of business going on within the immediate confines of the aircraft industry. In fact when these various items are totaled, with the possible exception of a few duplications, the monetary gross for all the various divisions of the industry will very likely fall in the neighborhood of $40,000,000 for the first half of this year.

As far as the general business situation is concerned all of the factors seem to indicate improvement. Col. Leonard P. Ayres, of the Cleveland Trust Co., in a recent statement clearly gave his belief that we are now in the early stages of a period of recovery. The Harvard Economic Society feel that the favorable factors as set forth by them earlier in the spring are still operative, and they remain unaltered in their firm belief in an early recovery of general business.

It is the general belief among business leaders that many of the current fears are unwarranted. Much of this same sentiment would seem to be equally applicable to the aeronautical industry.

Fig. 1—Increase in Air Mail Revenue

Company	First Four Months' Revenues	First Four Months' Excess Over 1929	Per Cent Increase
Aviation Corporation	$485,806	$40,859	9.2
National Air Transport	805,822	79,508	10.9
North American Aviation	483,863	158,806	48.8
United Aircraft	1,430,228	215,272	17.7
Western Air Express	837,999	175,937	26.6
Totals	$4,043,718	$670,382	16.5

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Aero Corp. Dividend

Aero Corporation of America has declared the regular quarterly dividend of 87½ cents on the 7% preferred stock, payable July 1st to stock of record June 15.

Great Lakes Aircraft

After writing off $664,000 for development expense and special reserves the Great Lakes Aircraft Corp., reports for 1929 a loss of $848,841.

In order to provide increased working capital directors have authorized the issuance of 100,000 shares of class A stock for subscription by stockholders at $7.25 a share, on the basis of one-half share additional for each share held June 16. The rights expire June 30.

As of Dec. 31, 1929, current assets stand at $1,627,138, of which $602,675 was cash and $938,789 inventory, against current liabilities of $207,576. The balance sheet also shows bank loans of $325,000 due Feb. 27, 1931, and a loan from an affiliated company of $100,000 due Jan. 15, 1931.

Union Oil Subsidizes Gliding for Employees

LOS ANGELES (CALIF.)—Gliding as a recreational activity among its employees is being officially sponsored by the Union Oil Company of California, with headquarters in Los Angeles. The company has subsidized employee gliding to the extent of a $750 fund, in addition to furnishing aid for repairs and maintenance, glider port sites on company land, hangar facilities, transportation, etc.

Three groups of twenty members each have been formed, with Ray Tatum as president, and with the membership drawn from seven or eight different departments of the firm. The first group has purchased a Detroit Gull glider and is taking instruction at Vail Field, former Western Air Express headquarters, under direction of Albert E. Hastings, operator of the Autowplane School, at Los Angeles Airport.

Under the cooperative purchase plan which has been worked out, members of the first two glider groups will contribute $10 each to a fund for the purchase of the glider, the remainder being supplied by the company. The third group will use the first glider but will contribute their $10 each to the general fund, which will in turn be used to provide a secondary trainer or soaring glider for the first group to complete primary training.

Los Angeles to Have Aerial Police

LOS ANGELES (CALIF.)—Creation of an aerial division of the Los Angeles police department has been approved by the Police Commission of the city. A group of ten well-known pilots have offered their services and planes to the city without cost and will draw no pay. The approved list includes Lieut. Henry H. Ogden, a member of the Army's around-the-world flight group; Col. Richard Barnitz, director of airports for Los Angeles city; Rufus J. Pilcher, pilot for the Richfield Oil Co.; Bud Campbell, pilot of the Goodyear airship "Volunteer"; W. E. Thomas, Lieut. Paul E. Richter, Jr.

A.S.T.M. Considers Aeronautical Materials

ATLANTIC CITY (N. J.)—A symposium on Aircraft Materials occupied the thirteenth and fourteenth sessions of the thirty-third annual meeting of the American Society for Testing Materials. These sessions were held on June 27, both morning and afternoon, while the society was convened at Atlantic City. Eighteen papers in all were read and every phase of the selection and testing of aircraft materials was covered.

The introduction was given by Horace C. Knerr, president of the Metallurgical Laboratories, Inc., Philadelphia. He stressed the fact that there is no industry which requires a more definite knowledge of the properties of materials and the types of construction used. J. B. Johnson, Materiel Division, Wright Field, Dayton, Ohio, gave a very complete paper on "Ferrous Metals Used in Airplane Construction." He went into much detail on sheets, tubes, cables, and wire, and gave many general specifications for these classes of materials.

Many Subjects Covered

Three research engineers from the Aluminum Company of America combined to offer a paper entitled "Structural and Engineering Light Alloys for Aircraft."

The paper, by Messrs. R. L. Templin, F. V. Hartman, and E. C. Hartmann, dealt with the wrought and cast alloys of aluminum and magnesium. The advantages and designations of each, along with tables of data, were given.

"Strength and characteristics of Wood Used in Aircraft Construction," by G. W. Trayer of the Forest Products Laboratory, U. S. Department of Agriculture, was a complete treatise on wood construction. Mr. Trayer's chief points were that wood has a high ratio of strength to weight, it is cheap and suitable to close designing.

Non-uniformity in the quality of wood is probably the most important quality to retard its future use. There are at the present time many tests and much data which may be used to assist anyone using wood construction.

Paper Read on Corrosion Prevention

Mr. W. E. Emley of the Bureau of Standards gave a paper entitled "Aeronautical Textiles." This paper described all the various properties of fabrics required in the aeronautical industry. Two important advances were noted: first, that coated cotton fabric is now being used in place of goldbeater's skin for gas cells; and secondly, cotton is now replacing silk in parachutes.

Two papers on the subject of corrosion prevention, the first by H. S. Rawdon, of the Bureau of Standards, and the second by H. A. Gardner, of the Institute of Paint and Varnish Research, were given at the session.

Mr. Rawdon's paper was based on information supplied by leading aircraft manufacturers and presented a resumé of present day commercial practice. Mr. Gardner's paper discussed various types of wing dopes and compared acetate with nitrate dopes. The coating of steel parts on aircraft was given considerable attention. He also described the plating and other finishing processes now in use. Methods of treating duralumin pontoons and hulls were described.

Material given on the failure of aircraft engine parts and the causes thereof, by T. T. Neill of the Bureau of Standards, was derived chiefly from information obtained during two years of aircraft engine testing. The paper described many failures of various parts in the engine and the conclusion was drawn that the lack of sufficient development work by the manufacturer was responsible for the majority.

Professor T. H. Frost of Massachusetts Institute of Technology read a paper entitled "Photo-Elastic Studies of Aircraft Parts" in which he described the machine and methods used when so testing. Various weaknesses which might be detected by the photo-elastic method were discussed and pictures showed various models made up for testing.

The concluding paper of the session was "Heat Treatment, Process Control, and Results, Ferrous and Non-Ferrous," by Horace C. Knerr. Mr. Knerr based his paper on his experience over many years while at the Metallurgical Laboratories, Inc., at Philadelphia. His paper contained many valuable facts.

Jumpers Must Use Auxiliary Parachute

WASHINGTON (D. C.)—Beginning August 1, those making parachute jumps for the purposes of exhibition, testing, training, or demonstration will be required to wear an auxiliary pack, due to an amendment made to the Air Commerce Regulations. The extra parachute must be so arranged that it can be operated in the event the first pack either fails to function or becomes fouled on any part of the plane or body of the jumper.

Belgian Holds Light Plane Record

NEW YORK (N. Y.)—Word from the Federation Aeronautique Internationale by the National Aeronautic Association states that the present world altitude record for light planes is held by M. Albert, Belgium, who ascended to 25,360 ft. in a flight on February 11. Thus the height of 24,074 ft., reached by Barney Zimmerley in a Lambert-powered Barling NB-3, on February 16, at St. Louis, stands as the American record.

Legislative Air Group To Convene August 18-20

CHICAGO (ILL.)—Among the speakers who will address those attending the National Legislative Air Conference, to be held August 18-20 at Northwestern University, are Gov. Louis L. Emmerson of Illinois; Gurney Newlin, past president of the American Bar Association; William P. MacCracken, Jr., Col. Clarence M. Young, George B. Logan, Maj. G. L. Lloyd, and Maj. Reed G. Landis.

This conference is to be sponsored by the Aerial Navigation Commission of Illinois, the Chicago Association of Commerce, the Midwest Air Parley of the N.A.A., and the Air Law Institute of Northwestern University.

Foreign authorities, who are to participate in the Air Law Institute course of Northwestern University from August 6-19, will also deliver lectures at the National Legislative Air Conference.

More than 30 state governors have indicated they will attend the sessions, which will be convened in the Northwestern Law School building. Persons interested in the conference and desiring further information on the event may obtain it by writing Professor Fred D. Fagg, Air Law Institute, Northwestern University.

Navy Buys Mercury Racer for $1

WASHINGTON (D. C.)—For the sum of $1 the Mercury Flying Corp, New York City, has sold the Mercury seaplane racer to the Navy Department. This is the craft which was to have been flown in the Schneider Cup Races last year by Alford J. Williams, then a Navy flier, but which proved unsuccessful in test flights. The sale was consummated in accordance with an agreement made prior to the racer's development, which the Navy aided to the extent of approximately $170,000, that figure including the cost of the 1,200 hp. Packard engine, amounting to about $104,000. (The Navy's acquisition of the Mercury is the reverse of the move just made by the English government which sold one of England's Schneider Cup planes to a private concern.—ED.)

McGill Glider Co. to Move

SAN FRANCISCO (CALIF.)—McGill Glider Co. of this city which now manufactures three types of gliders and a soaring plane, is moving to larger quarters at 225 Tehama St., providing 5,400 sq.ft. of floor space. The concern will soon start commercial production of a new soaring plane.

Boeing Fighter Reaches 33,000 Ft.

SEATTLE (WASH.)—An altitude of about 33,000 ft. has been recorded by a Wasp powered Boeing P-12 Army pursuit plane with full military load, according to the Boeing company.

Issues Questionnaire For U. S. Fliers Abroad

WASHINGTON (D. C.) — For the benefit of Americans who are planning to take planes abroad with them, a questionnaire has been devised which concerns aero regulations to be encountered in foreign countries.

Hugh R. Wilson, United States Minister to Switzerland, has compiled the questions, and while issued especially for those intending to visit Switzerland, they are also applicable to many of the rules existing in other European countries.

Included in the questionnaire are the following queries:

Make of machine, type of machine, serial number, American registration number, international serial number, whether insured in Switzerland, and with what company, whether machine is equipped for photographic work, number and type of engine, whether machine is meant for ultimate sale during trip, whether trip is made in purely private capacity, whether trip is made for purpose of advertising or obtaining orders for planes or equipment, in what cities will plane land, and approximate dates.

As regards personnel: Pilot's name, birthplace, nationality, former military status, present military status, present civilian status, pilot's registration number with the Department of Commerce, United States license number and date, international license number and date, membership in any international aviation organizations, name of owner of plane, person liable for damage, person liable for pilot's possible indebtedness for supplies of gasoline, oil, etc.; in those cases where the Legation makes the request for landing permission, to whom should any restaurant, hotel, or other bills be sent, in case personnel overlook their payment before departure.

Present Method Explained

This questionnaire is not official, but has been suggested by Mr. Wilson for promulgation by the Department of State. Persons proposing foreign trips should make certain that they have fulfilled all such information requests as those outlined above before flying.

Under prevailing methods an American flying tourist temporarily joins the official flying club of some country which, for a deposit representing approximately 40 per cent of the craft's value, issues the airman a "triptych."

This "letter of credit," so to speak (similar to those issued to motor car owners), allows the flier free entry into other countries he may wish to visit. Then at the conclusion of the trip the aviator's initial deposit is returned him.

Sioux Falls Airfair, Sept. 1-4

SIOUX FALLS (S. D.) — Prizes amounting to over $3,500 will be offered winners in the second annual Sioux Falls Airfair, to be held here September 1-4. The event has N.A.A. sanction.

Instrument Firm Has Flying 'Lab'

NEW YORK (N. Y.) — The Pioneer Instrument Co., a division of the Bendix Aviation Corp., has bought a Stinson Junior which it plans to use for research purposes and for executive travel. The plane will be fitted with radio, an earth inductor compass, and other equipment for carrying on experiments.

Arrange for Tour Of New York State

BUFFALO (N. Y.)—More than a score of commercial planes of every type and size will leave Buffalo July 14 on the first leg of the second New York state air tour which will take them to all corners of the state in five days.

The tour, under the sponsorship of the New York State Aviation Commission and state chapters of the National Aeronautical Association, is being arranged by a special committee headed by Joseph H. Dotterweich, prominent Buffalo private flier and former head of the Buffalo Aero Club. Russell Holderman, manager of the Donald Woodward port at LeRoy, is field marshal.

After leaving Buffalo, the first stop on the tour will be Niagara Falls where pilots will be officially received for lunch. Official receptions also are scheduled at Rochester and Syracuse. Other stops will be made at Hornell, Norwich, Gloversville, Poughkeepsie, Utica, Schenectady and Albany. A banquet here at the Hotel Statler July 19 will close the tour. The first New York state tour was held in 1925.

Ban May Be Rescinded On Martin Russian Order

WASHINGTON (D. C.)—Removal of the ban placed by the State Department on the sale of military airplanes to Soviet Russia is a possibility. The Department may withdraw its objections if it can be shown that the equipment desired could be procured elsewhere than in the U. S.

The situation arose over the voluntary action on the part of the Glenn L. Martin Co. of Baltimore in asking the State Department if it had any objection to the sale of military airplanes to Russia. The State Department replied that it did object to such a transaction.

As the result of this incident, members of Congress have asked the State Department to reveal the source of its authority to prevent the sale. In reply, the Department officials contend that their authority in such cases is implied but not actual.

(The same question is being discussed in connection with the State Department's attitude in respect to the sale of foreign bond issues in this country.)

As was noted in the story carried on page 1275 of the June 28 issue of AVIATION, the Glenn L. Martin Co.'s compliance with the State Department's wishes in the matter was entirely volitional.

The present policy with respect to Russia, official sources declare, is only invoked to discourage the sale of any completed military weapon not susceptible to non-military use.

Air Mail Statistical Report for April, 1930

Route Number and Termini	Length of Route (Miles	Frequency (Rd. Trips per Month Scheduled)	Miles of Service — Scheduled	Miles of Service — Actually Flown	Total Weight of Mails Dispatched (Pounds)	Amount Paid to Contractor
1. Boston-New York	192	26	17,280	15,936	11,058	$33,174.75
2. Chicago-St. Louis	278	60	33,360	30,632	4,719	11,943.94
3. Chicago-Dallas	1,059	60	123,200	111,463	38,988	116,765.17
4. Salt Lake City-Los Angeles	600	56	67,200	64,762	72,328	216,985.50
5. Salt Lake City-Pasco	530	60	63,600	63,412	23,251	69,754.50
8. Seattle-Los Angeles (a)	1,141	30	63,870	62,964	21,773	61,777.08
9. Chicago-Minneapolis	664	90	83,460	79,667	18,831	51,785.16
11. Cleveland-Pittsburgh	123	60	15,252	14,391	5,399	16,197.37
12. Cheyenne-Pueblo	199	30	12,231	12,084	7,673	6,368.28
16. Cleveland-Louisville	345	30	22,312	21,312	6,669	8,125.68
17. New York-Chicago	718	60	117,611	108,341	145,884	116,826.60
18. Chicago-San Francisco	1,932	60	231,028	216,859	163,076	330,417.06
19. New York-Atlanta	780	60	104,742	91,074	38,504	115,513.31
20. Albany-Cleveland	446	26	23,192	21,826	5,664	6,287.59
21. Dallas-Galveston	320	30	19,200	19,070	3,341	9,655.13
22. Dallas-Brownsville	529	30	31,740	30,738	7,225	20,879.17
23. Atlanta-New Orleans	483	30	28,980	28,927	9,292	16,261.22
24. Chicago-Cincinnati	270	60	34,665	32,108	6,740	9,908.17
25. Atlanta-Miami	754	30	47,968	47,471	17,341	25,318.18
26. Great Falls-Salt Lake City	489	30	38,160	38,084	4,696	11,623.37
27. Bay City-Chicago	773	26	46,365	44,594	16,686	14,850.26
28. St. Louis-Omaha	494	60	49,050	46,076	14,695	11,535.43
29. New Orleans-Houston	319	30	19,459	19,345	3,960	3,959.87
30. Chicago-Atlanta	768	30	59,801	55,951	12,277	9,575.82
32. Pasco-Seattle	449	30	32,280	32,153	16,185	1,456.65
	14,565	1,094	1,386,006	1,309,240	676,255	$1,296,945.26

(a) Southbound trip not operated between Seattle and Portland.

Supplemental Payments: Route 18, Jan., 1930..... $119.32
Route 27, March, 1930... .22

NOTE—Close comparisons between the various air mail reports from time to time will reveal sligh discrepancies in various figures. These are not errors, strictly speaking, but are due to various readjustment which have to be made from month to month after the preliminary figures have been released.

Second Indiana Tour Covered Seventeen Cities

INDIANAPOLIS (IND.)—Thirty airplanes of various types and sizes landed at Stout Field, Indianapolis, Saturday, June 21, after a six day tour of the state.

This flight, the second annual all-Indiana air tour, started Monday, June 16, from Hoosier Airport, Indianapolis, visiting seventeen cities. Twenty-eight planes started, and two were picked up in the course of the tour. The eight fastest machines concluded the trip with a race from Rushville to Indianapolis, won by French Livezey of Hoosier Airport, flying a Travel Air.

Mrs. Phoebe Omlie of Memphis, Tenn., only woman pilot who flew a Monocoupe, was awarded the silver reliability trophy offered by the Indianapolis Solo Club, while Clarence Dowden, covering the route in a Travel Air, received second award.

Take Part in Dedication

The first overnight stop was at Evansville, in the southwestern corner of the state. Other towns visited were Columbus, Madison, Princeton, Greencastle, Terre Haute, Lafayette, Michigan City, Gary, Plymouth, South Bend, Fort Wayne, Huntington, Kokomo, Muncie, Rushville, and Indianapolis. The fliers took part in the dedication of the new $50,000 airport at Michigan City.

Over the 1,244 mi. there were no mishaps, and but few delays. Civic organizations of the stop-over cities provided entertainment for the birdmen.

Considerable attention was attracted by the Chevolair D6 engine, manufactured in Indianapolis by Arthur Chevrolet, which was mounted in a Travel Air.

Lee H. Hottel of Capitol Airport was tour director and was assisted by Herbert O. Fisher.

Developing Small Propellers

GLENDALE (CALIF.)—A series of propellers for light plane engines is being developed by the Story-Gawley Propeller Co. of this city. C. S. Story is chief engineer of the firm, whose offerings include six models ranging in size from the 2 hp. propeller, 30 in. diameter, to the 25 hp., propeller, 54 in. diameter. The Story-Gawley concern reports that, largely as a result of orders for propellers for use on low-powered engines, May sales more than doubled those of April and the first two weeks of June exceeded sales for the like period last year.

Federal Job to Fairchild Survey

LOS ANGELES (CALIF.)—An aerial survey of the Palo Verde and Cibola Valley districts, near Blythe, Calif., is being conducted for the United States Reclamation Service by Fairchild Aerial Surveys, Inc., of this city, in a Fairchild. About two hundred and thirty-eight square miles of land are to be surveyed in ten days' time.

Three Main Rings of the Navy Airship "Akron" Are Now in Place at Goodyear-Zeppelin Airdock

AKRON (OHIO)—Work on the new Navy airship "Akron" (ZRS-4), being built at the Goodyear-Zeppelin airdock here, is being accelerated gradually as the huge duralumin skeleton begins to take shape. Three main rings are now in place and others are in process of assembly on the dock floor. The fourth ring is to be placed on the ways shortly.

Placing of the rings has provided more points at which men can be employed, so that the maintaining of day and night crews is practicable. The workmen swarm over the framework like so many spiders. Some are fitting parts. Others are riveting members in place—silently. All rivets are pressed into position instead of being hammered, so that there is very little noise connected with the construction.

The first of 12 gas cells has been placed in position between the first two main rings to be erected. This cell has a gas capacity of about 1,000,000 cu.ft., almost one-sixth of the airship's total volume. The cell will be inflated, and stresses imposed on the various parts of the framework will be measured. During this operation, the cell and framework will be held down by 144,000 lb. weight. (An order issued by the Navy Department resulted in the closing of the airdock to the public from June 13-23 while certain structural tests were taking place.)

Since the first main ring girder was placed on the ways—an operation that required a day and a half—methods have been improved so that the third ring was placed in 3 hr. By similar saving of time during all phases of construction, work on the craft is being carried on rapidly. The entire framework, including bulkheads, catwalks, fittings, and gas cells, will be completed before the outside covering is applied. This covering is to be a fire-resisting fabric having the strength of metal of the same thickness.

Tentative plans call for the floating of the "Akron" about May 1, 1931, while the Navy contract calls for delivery of the ship in June of the same year. By the end of this summer, the framework will have assumed a nearly complete appearance.

Sale of Mono Plant Rumored

MOLINE (ILL.)—A persistent but unauthenticated report is current that General Motors has secured an option on the Mono Aircraft and Lambert Engine companies of Moline. Another report has it that the Curtiss-Wright interests are about to acquire both companies. Both organizations are reported to be on the look-out for a small plane of established performance to fit into the production schedule at a low price. Officials of the Mono Aircraft decline to confirm or deny the report. Business at the Mono plant has been unusually good this season and an average of about two planes a week has been maintained for some time. Allied Aviation Industries of St. Louis has thus far controlled both the Mono Aircraft and the Lambert Engine companies.

Test Blind Flying Device

SCOTT FIELD (ILL.)—An army observation plane was recently flown from San Antonio, Tex., to Scott Field, Ill., by Capt. William C. Ocker, who piloted the craft from a covered cockpit by the use of a flight integrator invented by himself and his aide on the trip, Lieut. C. J. Crane. The latter corrected the "blind pilot's" direction when he strayed from the course several times and took charge of the landings. The trip of approximately 900 mi., made with one stop at Hatbox Field, Muskogee, Okla., was completed in about eight hours flying time. The integrator consists of a model airplane mounted on the instrument board and combines the functions of a turn and bank indicator and an inclinometer.

Army to Survey Alaskan Road Route

WASHINGTON (D. C.)—An aerial photographic survey of the proposed Yukon-Pacific highway and of the existing landing fields in Alaska, with a view toward additions to and improvement of facilities, is being undertaken by the War Department in collaboration with the Alaskan Road Commission. The Air Corps pilots will determine advantageous locations for establishment of new fields, both along the proposed highway and elsewhere, and will give technical advice to the Road Commission. They will also prepare a report on local conditions which affect the establishment of an Air Corps unit at the Alaskan Agricultural College and School of Mines at Fairbanks, and on the general advantages and disadvantages of stationing a unit in Alaska.

Air Corps pilots who will go on this mission are Capt. William S. Gravely, of Kelly Field; Lieut. George W. Goddard, Chanute Field; Lieut. Levi L. Beery, Wright Field. Maj. Malcolm Elliott, of the Corps of Engineers, president of the Alaskan Road Commission, or his representative, will also participate. The Navy, as is well known, has made two aerial surveys of Alaskan areas in conjunction with the U. S. Geological Survey.

Mining Firm Gets Third Plane

VANCOUVER (B. C.)—The Consolidated Mining & Smelting Company of Canada has just purchased its third airplane—a Curtiss Robin.

BRIEFLY

Glenn L. Martin Co., Baltimore, Md., held open house June 21 to celebrate the opening of the company's new plant.

Mrs. Florence L. Barnes has taken delivery of a Travel Air Mystery S monoplane at Van Nuys, Calif., and is said to be planning an attempt to better the women's speed record now held unofficially by Miss Amelia Earhart.

Ernest Goldtrap and Edwin Lee, formerly with Scenic Airways, Phoenix, Ariz., have leased Sky Harbor Airport there, and will continue operation of the field and the school formerly controlled by Scenic Airways.

Mayor Z. S. Leymel of Fresno, Calif., president of the local N.A.A. chapter, has invited officials of aviation companies in the state to meet at Fresno July 11-12, with a view to forming a California association for the advancement of aviation.

State Senator Henry D. Williams, of Utica, N. Y., member of the State Aviation Commission, has completed a round-trip flight to the West Coast made for the purposes of comparing developments in New York with other parts of the country.

American Eagle Aircraft Corp. reports the sale recently of nine planes in two days.

The U. S. Army Second Balloon Company has been transferred from Scott Field, Belleville, Ill., to Fort Bragg, N. C.

The 101st Observation Squadron of the Massachusetts National Guard will have two weeks training at Marstons Mills, beginning July 26.

William Filene's Sons Co., Boston department store, has been showing an exposition of aviation history, made in co-operation with the New York *Times*, and featuring Admiral Byrd's Antarctic expedition.

More than $4,000,000 is now invested in American model aircraft companies, according to a recent survey.

Action of the Brotherhood of Locomotive Engineers in voting not to merge with the Brotherhood of Locomotive Firemen and Enginemen is interpreted as an indication that aircraft pilots are not likely to be admitted to the Brotherhood.

Pensacola Metal Aircraft Corp., organized by P. L. Pierce, is considering erection of an airplane manufacturing plant at Pensacola, Fla.

George F. Zimmer and Henry A. Jencks, vice-presidents of International Airports Corp., are making inspection trips to company projects in the West and in New England, respectively.

Tucson, Ariz., has donated land for erection of a radio beacon near the Davis-Monthan municipal airport, and the Department of Commerce plans to make the installation in the near future.

Thirty-two scheduled trips over Colonial Airways between Boston and New York were cancelled between June 1 and 21 because of bad weather.

Complete S-40 Keel Blocks

BRIDGEPORT (CONN.)—Completion of the keel blocks on which the first two Sikorsky S-40, 47-place amphibions will be constructed is announced by Sikorsky Aviation Corporation. Pan American Airways has ordered these first S-40's and plans to use them on its line between Miami and Cristobal. The planes will be powered with four Pratt & Whitney 575 hp. Hornet B's. Dimensions of the craft are: length of boat hull, 58 ft. 6 in.; extreme width of boat, 10 ft. 4 in.; wing spread 114 ft.; wing chord, 192 in.; height on wheels, 22 ft. 11 in.; length of entire plane, including tail surfaces, 72 ft. 11 in. The machines will have a useful load capacity of 11,250 lb. and a gross weight of 28,000 lb.

Interest Aroused Over Lakes Cruise

DETROIT (MICH.) — Approximately 50 cities and towns in the Great Lakes and Georgian Bay region are seeking designation as stopping points on the route of the first Great Lakes Air Cruise, which will be sponsored by the Detroit Flying Club August 8-17, Wayne J. Sheldon, cruise commander, has announced here. Mr. Sheldon recently completed a "pathfinding" flight over the 2,700-mi. route.

Of 30 cities named as tentative stops prior to the pathfinding trip, Mr. Sheldon said, only two have been omitted, and those because their harbors were not adequate to handle the 25 or 30 seaplanes, flying boats and amphibions expected to be entered. The Cruise will be limited to 30 stopovers.

It also has been announced that the Cruise will carry pay passengers and 60 per cent of the income derived therefrom will go to the flying club to help defray expenses of sponsoring the event. There is a $50 entrance fee. The Cruise will be non-competitive.

A revised itinerary now reads: Detroit, Cleveland, Conneaut, Erie, Buffalo, Hamilton, Toronto, Barry, Little Current, St. Ignace, Munising, Port Arthur, Duluth, Houghton, Marquette, Green Bay, Sturgeon Bay, Sheboygan (Wis.), Milwaukee, Racine, Chicago, Muskegon, Traverse City, Petoskey, Alpena, Bay City, Port Huron and Detroit.

Form California Gliding Body

SAN FRANCISCO (CALIF.)—In order to aid in developing the sport of gliding in the State of California a subcommittee on gliding has been formed under the Statewide Aeronautical Committee of the California Chamber of Commerce. C. F. Liensch, head of the Aviation Department of the Union Oil Co., and chairman of the glider section of the Southern California Chapter of the N.A.A., is chairman of the gliding sub-committee.

Air Law Enforcement In Calif. to be Thorough

SAN FRANCISCO (CALIF.)—The following bulletin, recently issued by the California State Chamber of Commerce for the guidance of deputy sheriffs in enforcing the state air navigation act of 1929, indicates the extent to which California state authorities are attempting to supervise aeronautical activities within their jurisdiction. This is the first of a series of bulletins which it is planned to publish from time to time as new phases of enforcement may develop. A summary of the recommendations is given below:

1. Deputies should investigate all planes which do not carry the letters "NC" or "C" immediately before the number. This is in order to ascertain whether such planes are operated under proper letters of authority.

2. It might be well for deputies to scrutinize pilots' licenses, from time to time, in order to ascertain whether they are flying the type of equipment and doing the character of flying their license specifically permits. According to the California law, pilots must carry the type of license for the character of work which they are undertaking.

3. Deputy sheriffs will be rendering a very great service if upon learning of a crash in their county they ascertain the facts, obtain the names of witnesses, and send in this report to the nearest Department of Commerce Inspector. This will greatly help in the prevention of flying of damaged equipment which the Department of Commerce is not aware of.

To Consult Department of Commerce

4. Where pilots guilty of breaking the law tend to defy local authorities and indicate that they intend to plead not guilty and demand a jury trial, the deputies should immediately write or phone to the nearest Department of Commerce Inspector, present all of the facts to him and ask his advice regarding the handling of such a case. In most instances, the Department of Commerce Inspectors will advise that if the guilty party does not plead guilty and pay a fine that they will accept a complaint from the local authorities and handle the violation from the viewpoint of the Federal Government. In most cases this will mean a suspension of license and often a fine in addition.

5. It has been agreed that for the time being, or until further notice, no effort will be made to enforce the law regarding gliders, with the exception of the recently published rule of the Commerce Department that gliders cannot be towed behind other aircraft unless by specific authority of the Department of Commerce. Deputies are asked to check on any such flights, or proposed flights, in their counties.

The supervising inspectors of the Department of Commerce in California are: E. E. Mouton, Oakland Airport, and H. I. Hazen, Bendix Building, Los Angeles.

PERSONNEL

MAJ. ALBERT B. LAMBERT, patron of aviation in St. Louis and formerly one of the country's most prominent balloonists, has been appointed official starter for the International Balloon Races for the Gordon Bennett Cup, to be held at Cleveland, Ohio, Sept. 1.

OLCOTT PAYSON has returned to Skyways, Inc., as director of the company's school at Marstons Mills, Mass.

PRESTON SNEED has been reappointed municipal director of airports by the City Commission of Dallas, Tex.

JOSEPH DISTON, former Navy pilot, is now instructor in aeronautical engineering at the University of Oklahoma.

JOHN H. S. SKONING has been appointed to the staff of pilot-salesmen of Shell Oil Co., San Francisco, Calif. He was flying instructor at Brooks and Rockwell Fields during the War, and has been an air mail pilot.

H. L. CHATKOFF, member of the Lafayette Escadrille who was permanently disabled in a crash just after America's entrance into the War, has been voted the status of an A.E.F. veteran by the House of Representatives, and if the bill is passed by the Senate he will be eligible for pension.

WILLIAM F. CAREY, DONALD R. SHERIDAN, ROBERT J. DOUGHERTY, and EDWARD USHER, JR., have been assigned to the New York office of Nyrba Air Lines as traffic representatives.

WARREN E. DANIEL has been elected president of Southwestern Air Club, Oklahoma City. ERNEST W. FAIR is vice-president and general manager, and WILLIAM WITT is secretary-treasurer.

DOUGLAS B. CAMPBELL, who has been principal of the ground school, is now director of the Universal Aviation School at Memphis, Tenn. He succeeds A. D. NIEMEYER, who is now pilot on the St. Louis-Chicago air mail service.

C. W. BENNETT is now general manager of Garland Aircraft Corp., Tulsa, Okla. He succeeds O. M. BOUNDS, who resigned to become pilot-salesman for Continental Oil Co., Ponca City. HAROLD S. CHRISTENSEN, recently with S.A.F.E., is now chief instructor for the Garland firm, succeeding E. C. EPPS. C. D. ELLISTON has been made chief ground instructor, replacing CHARLES R. CHACHMAN, who has accepted a position with Parks Air College, E. St. Louis, Ill.

GEORGE H. BENEFIEL, of Tucson, Ariz., has been appointed governor of the N.A.A. for Arizona. He succeeds WILLIAM G. HERRON, of Phoenix, who has accepted a position with the Curtiss-Wright Corp. in New York.

CAPT. ARTHUR C. HARDY, manager of St. Hubert Airport, Montreal, Que., has been transferred to Regina, Sask., where he will direct the construction of an airport under the supervision of the Civil Aviation Branch of the Department of National Defense. GEORGE C. WAKEMAN, divisional superintendent of airways and airports, will be temporary manager of St. Hubert Airport.

Jones, Green Open Bureau

NEW YORK (N. Y.)—Ernest Jones and Edward E. Green, formerly with the General Development Co., of Conn., have established an engineering and general service bureau in New York City to conduct experimental work in engine and aircraft design. Statistics, investigations and patent research comprise a second field in which the organization will work.

SCHOOLS

SHANK FLYING SERVICE, Robinsdale, Minn., is offering a special five-weeks' summer course.

TEXAS MILITARY COLLEGE, Terrell, Tex., announces that it will offer ground and flight instruction in 1930-1, as extra-curricular subjects.

PENN SCHOOL OF AVIATION, with headquarters in Pittsburgh, Pa., has announced the opening of a section in Harrisburg at the new airport there. The curriculum is based on army methods and includes ground school and mechanics' courses, which may be taken either in conjunction with flight instruction or separately. At present only limited commercial and private work will be offered.

STANDARD FLYING SCHOOLS, Los Angeles, recently graduated one transport pilot, seven limited commercial, and five private pilots, all of whom were examined and approved for license by the Department of Commerce.

New Firms Announced

AVIATION SERVICES, LTD., Los Angeles, Calif.; capitalization, $150,000; directors, John Wood, Ralph Yates, J. E. Waterhouse, E. G. McLeond, and C. E. Coggins; to manufacture, repair, and store airplanes.

WESTERN COLLEGE OF AERONAUTICS, LTD., Los Angeles; capital stock, $25,000; directors, Carl S. Clark, Granville H. Pain, Richard E. Harding, C. G. Rockstroh, and W. M. Rheinschild.

WEST COAST AVIATION SERVICE, INC., Los Angeles County; capital, $50,000; by George T. Gettele, W. E. Gifford, A. P. Johnson, and W. J. Kirby, Dale Straw, and others.

CAPITOL AIRCRAFT SALES, INC., South Washington, Va.; capital stock, $50,000; by William L. Livingood and others.

WESTFAHL AIRWAYS, INC., Oconomowoc, Wis.; by Herold C. Westfahl, Phillip C. Westfahl, and Ted Schwantes; to operate the new Oconomowoc Airport and the Milwaukee County Airport, to offer instruction, taxi, and aerial photographic service.

Representatives Named

MONOCOUPE — Ernest Goldtrap and Edwin Lee, Phoenix, Ariz., for Arizona.

STINSON—Dennison Airplane Sales Co., Dennison Airport, Quincy, Mass.

AERONAUTICAL CALENDAR

July 4-19	New York State Air Tour, starting from Buffalo.
July 5	English King's Cup Race.
July 9-18	Second Michigan Air Tour, sponsored by Board of Commerce, Pontiac, Mich.
July 12-13	International Rally to Liege, Belgium
July 20-Aug. 7	International Light Plane Tour, starting from Tempelhof Airport, Berlin, Germany.
July 21	All-America Flying Derby, starting from Detroit, Mich. Sponsored by American Cirrus Engines, Inc., Marysville, Mich.
Aug. 9-24	International Gliding Meet, auspices Rhoen-Rossiten Gesellschaft; the Wasserkuppe, East Prussia, Germany.
Aug. 23-Sept. 1	National Air Races, Chicago, Ill.
Sept. 1	Gordon Bennett International Balloon Race, Cleveland, Ohio
Sept. 11-27	National Air Tour, starting and ending at Detroit, Mich. Manager: Capt. Ray Collins.

EXPOSITIONS

June 28-July 6	Pacific Coast Aeronautical Exposition, Oakland, Calif., Municipal Airport.
June 28-July 6	Aviation Show, Oakland, Calif., sponsored by American Legion, Northern California Aero Club, and Oakland Chamber of Commerce.
July 1-6	Aircraft and Sportsman's Exposition Transcontinental Airport, Toledo, Ohio
July 6	International Transportation Exposition, Warsaw, Poland.
Sept. 6-8	International Aero Exhibition, Stockholm, Sweden.
Nov 28-Dec. 14	International Aero Show, Grand Palais, Paris, France, under the auspices of Chambre Syndicale des Industries Aeronautiques.

MEETINGS AND CONFERENCES

July 8	Conference on World Airways, Geneva, Switzerland; auspices of the League of Nations.
July 11-12	Aeronautical Chamber of Commerce Western District Meeting, Denver Colo.
Aug. 18-21	National Legislative Air Conference, Levy Mayer Hall of Law, Northwestern University, Evanston, Ill.
Aug. 26-28	S.A.E. Aeronautic Meeting, Chicago, Ill.
Sept. 1-6	Fifth International Air Congress, under the auspices of the Royal Aero Club; The Hague, Holland.

DEDICATIONS AND MEETS

July 4-6	Air Meet, Lake Placid, N. Y., Airport, under the direction of Lake Placid Flying Service.
July 4-6	Dedication and meet, Milford, Pa. Airport.
July 4-6	Chippewa Falls, Wis.
July 6	Curtiss-Wright Airport, Milwaukee, Wis.
Aug. 1-2	McGhee Tyson Airport, Knoxville Tenn.
Aug. 2-3	Air Meet, Danville, Ill.
Aug. 9-10	Air Fair, Grand Rapids, Mich., Airport
Sept. 1	Wauchula, Fla., Airport.
Sept. 1-4	Second Annual Sioux Falls (S.D.) Airfair.
Sept. 13-14	Duluth, Minn., Airport.
Sept. 13-14	Williamson Johnson Airport, Duluth Minn.
Oct. 17-20	Denver, Colo., Municipal Airport.

AIRPORTS AND AIRLINES

Fires Break Out At Chicago Ports

Municipal Field Suffers Damage of About $1,000,000

CHICAGO (ILL.)—Two fires occurring almost within 48 hr. of each other at airports near Chicago, one believed definitely to have been of an incendiary nature, have led airport and airline operators to increase their vigilance in guarding their property against further possible depredations of a "firebug."

Hangars, planes, engines and other equipment valued at $1,000,000 were destroyed at Chicago Municipal Airport in the first fire, which started sometime between 12:20 and 12:30 a.m., Wednesday, June 25. This blaze was at first attributed to a discharge of static electricity while the fuel tanks of a Fokker F-10 were being drained in one of the hangars operated by Universal Air Lines, but when the circumstances became known surrounding the outbreak of a second fire in a hangar at Palwaukee Airport early Friday morning, officials of some of the airlines that suffered losses in the blaze at the municipal field were willing to admit the possibility that it might have been incendiary, although no reason could be ascribed.

Thirty Planes Lost

The fire at the municipal airport razed both hangars and the machine shop of the Universal organization, and spread to the double hangar leased by Stout Air Services, Inc., from Chicago Title and Trust Company, receiver for Chicago Air Service, Inc., former operator of Sky Harbor and Gray Goose Air Lines. Thirty planes, fourteen engines and much valuable hangar and shop equipment were destroyed.

Stout Air Services suffered probably the smallest loss, estimated at $5,000 by Walter Swan, Chicago traffic manager. None of the Stout planes was burned, even though the building was practically destroyed. They were all in the west portion of the double hangar unit and were pushed out on the field before the flames reached them. However, 21 other planes, the majority of them in the east portion which was adjacent to the Universal structure and was utilized as a service hangar, were consumed in the blaze.

Two of the 21 planes lost in the Stout hangar were Stinsons of Thompson Aeronautical Corp. The remaining nineteen included ten privately owned craft. These were a J-5 Stearman; two Travel Airs; a Curtiss Robin, a Laird biplane; Swallow, Waco, Lockheed, Fleet, and an Argo. The rest of the machines were the Shell Petroleum Fokker F-10; an International in dead storage; an SE-5, the property of Sky Writer Corp. of America; a Fokker Super-Universal, one of the demonstrators owned by Fokker Aircraft Corporation; a Detroit Aircraft Corporation Ryan monoplane; a Stinson Junior; two Monarchs and a Fairchild KR34.

Four Men on Duty Nearby

Four men were on duty in the Universal hangar unit when the fire started sometime between 12:20 and 12:30 a.m., Wednesday, June 25. One, a negro porter, was sweeping up the restaurant. Two mechanics who had been draining the gasoline from one of the Fokker F-10-A's housed in the west hangar were in the pilots' quarters in the east hangar. They had gone there to eat their midnight lunch. Leon Hood, operations manager for Northwest Airways, which operates from the Universal structure, was in the operations office. The fire broke out in the west unit.

The flames spread rapidly, so rapidly in fact that half a dozen men sleeping in quarters on a balcony at the rear of the west hangar were forced to jump from windows to the street in order to save their lives. Most of the planes had been fully serviced, it is reported, and as the fire reached the gasoline tanks there was one explosion after another. The heat was so intense that the Stout hangar was ignited as a result of its proximity to the Universal structure, while the Universal machine shop and the east hangar, which are in reality within the same building, were set off by flaming gasoline that spread out over the floor.

Firemen Experienced Difficulties

Fire Marshal Carmody complained afterward of the fire fighting facilities at the airport. There are fire hydrants

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Okla. Short Line Starts

TULSA (OKLA.)—The Oklahoma Short Line Airways has started a daily service from here to Memphis and return. The following schedule will be observed:

Lv. 3:00 p.m.	Tulsa	11:30 a.m. Arr.
4:00 p.m.	Fort Smith	10:30 a.m.
5:00 p.m.	Hot Springs	9:30 a.m.
5:15 p.m.	Little Rock	9:15 a.m.
Arr. 6:30 p.m.	Memphis	8:00 a.m. Lv.

The fare from this city to Memphis is $28.50, with corresponding intermediate rates. Express is carried for $1 per pound up to 6 lb., and $0.50 per pound thereafter.

Revised Air Mail Map Still Uncertain

WASHINGTON (D. C.)—Although no decision on the new air mail map had been reached by the Comptroller General as AVIATION goes to press, it is believed that he will approve whatever arrangements in regard to extension or bidding the Postmaster General may desire to make. Each line will be judged on its own merits and in relation to the building up of the whole map, Assistant Postmaster General W. Irving Glover told AVIATION's correspondent. By this policy of considering each line individually, Mr. Glover stated, extensions of as much as 700 mi. may be given in some cases, whereas in others no extensions will be approved.

Should the tentative arrangements which have been made between the operators be thrown out, thereby admitting actual competitive bidding, the whole air mail rate structure would be destroyed, apprehensive contractors fear. Few lines in the country made money when mail payments were on the poundage basis, because of ruinous underbidding for contracts, they declare, and they see little hope for more conservative bidding if the field is thrown open now.

Losing Price May be Forced

Some operators have stated that if forced to bid in order to save their original investments they would bid a losing price for mail contracts, with the expectation that after the first 2 yr. of the contract had expired, and the rates were subject to modification in the light of their experience they would be raised to an adequate figure by the Postmaster General.

However, the Watres bill requires that the Postmaster General report to Congress each year what changes he has made in compensations, and his reasons for such action. If a bidding rate of $.10 should be raised to $1, even though the higher figure may be entirely justifiable, the Postmaster General will have difficulty in defending himself against the Congressional bombardment which is apt to follow, it has been pointed out.

The possibility of the establishment of a rate-fixing commission growing out of Congressional misunderstanding or dissatisfaction with such a situation is not far-fetched, some contractors believe. A bill is now pending in Congress for the establishment of a regulatory body for commercial aviation which would correspond to the Interstate Commerce Commission in its relation to the railways. No action has been taken.

Hartford Announces Airport Extension Plan

HARTFORD (CONN.)—Plans for the ultimate layout of Brainard Field have been drawn up by architects and announced by the Hartford Aviation Commission. When the present field is enlarged by adding land already city-owned, it will comprise 450 acres. The commission has allowed for the accommodation of all types of aircraft, including dirigibles, a mooring mast for which will be installed at the south end of the field. Allowance has been made for mooring airships of at least 1,000 ft. length. From the base of the mooring mast to a depot at the south of the field will be an underground passage permitting passengers to travel between the two points without walking across the open field.

A road will completely circumvent the field and will traverse the dike along the river, a project which has already been started to protect the port against spring floods. When the field is developed to its western extremity, the city administration building will be built diagonally across the northwest corner so that a commanding view of the entire field may be had at all times. An observation tower will surmount the office building, it is planned. The buildings within the present airport area include: The hangars of Curtiss-Wright Flying Service, Charles Descombe Flying Service, Inc., Pratt & Whitney Aircraft Co., State of Connecticut Aviation Department Connecticut National Guard administration office, hangars, and post exchange, and Interstate Airways, Inc.

To Create Medal for Mail Pilots

WASHINGTON (D. C.)—The House of Representatives has passed a bill authorizing the President to award a special medal of honor for distinguished service as an air mail pilot. It is provided that any pilot who has been in the service since May 15, 1918, is eligible. After a pilot has received the medal, he may be awarded bars for additional distinguished service. The bill was introduced by Representative Kelly of Pennsylvania.

Nyrba Line Reports Traffic for Five Months

NEW YORK (N. Y.)—During the first 5 mo. of operation, ended May 1, Nyrba carried 5,055 passengers, averaging more than 1,000 per month. In this time, over 7,000 lb. of air mail were carried, and company planes flew 506,350 mi. on regular schedule, maintaining a regularity of 99.3 per cent. There has been no serious accident. Most of the passengers, according to Col. R. A. O'Neill, president, were commercial travelers from the United States, Brazil or Argentina, and tourist traffic has been very light.

On June 1, the company had 29 planes in service, of which nine were Consolidated Commodore flying boats. A tenth Commodore has been placed in service since that time, and four more are ordered. The greatest volume of mail comes from Buenos Aires, with Brazil next, and Brazil is first in contributing passenger traffic.

Offer Freight Service From New York to India

NEW YORK (N. Y.)—Arrangements have been made for handling freight from this city on a through bill of lading to any point on Imperial Airways' lines, through co-operation between that company and the Cunard Line. Later it is hoped that combined rates may be offered, but for the present the cost will be simply the combined cost of the services, on the following basis:

		Minimum
N.Y.—Southampton..	$0.90 per 100 lb. or .50 per cu.ft.	$5.00
Southampton—London	.02 per lb.	2.50
London—Alexandria..	.52 per lb.	1.15
London—Bagdad.....	.85 per lb.	1.88
London—Karachi....	1.26 per lb.	2.77

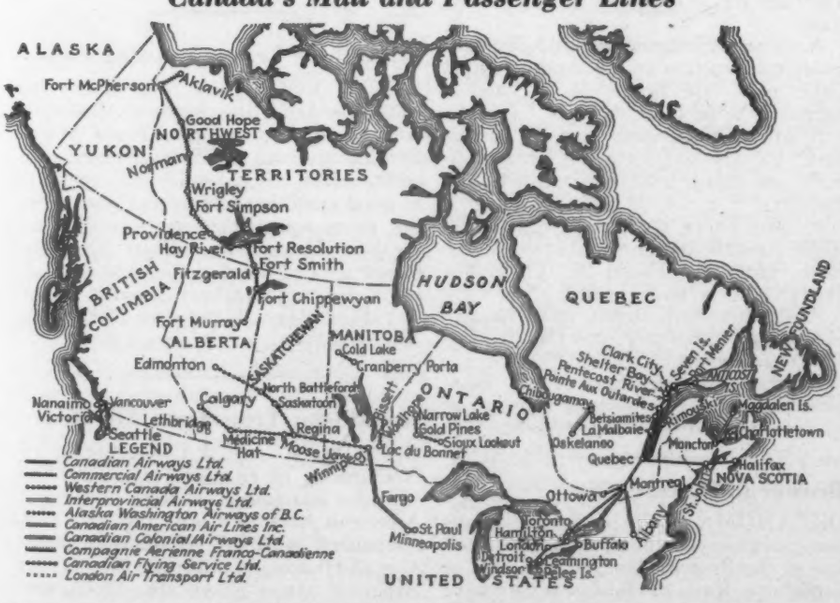
Special rates will be quoted for precious stones, specie, or bullion. According to P. E. Bewshea, American representative of Imperial Airways, it is planned eventually to make arrangements with American airlines for through billing from any point in the United States to the points served in Europe, Africa, and Asia, and vice versa. At present cases up to 150 lb. can be accepted regularly for shipment, and if prior advice is given, cases up to 300 lb. may be accepted. This amount may be increased when the new 40-place Handley Page planes are put in service.

An interesting feature of the new arrangements is that now freight may be shipped to points as far east as India much more quickly through New York than by boat from San Francisco. Delivery is made to Bagdad in thirteen days, and to Karachi in sixteen, with corresponding time to intervening points. The saving in some cases is as much as six weeks, and packages sent from San Francisco to Calcutta by the new service should reach their destination between two and three weeks ahead of those sent by boat across the Pacific Ocean. Even for mail, there should be some saving, and after the service has been operating for a while, the time may be reduced. Plans are also under way for expanding it to include Kenya Colony, Tanganyika, Rhodesia, and South Africa, when the Imperial Airways' Cairo-to-Cape Town line is opened up late this fall or early next year.

Air Ferries, Ltd., Changes Base

SAN FRANCISCO (CALIF.) — Air Ferries, Ltd., has transferred its Oakland terminal from the foot of Franklin St. to the newly completed San Francisco Bay Airdrome at the Alameda end of the Oakland-Alameda tube. From this terminal, it is possible to reach the business center of Oakland in 5 min., and the West Alameda business district in 4 min. Free motor bus service from the airport to 14th St. and Broadway, Oakland, is soon to be provided. A passenger depot for Air Ferries is being built, as well as a hangar for all the company's planes and a repair shop. No schedule changes have been announced.

Canada's Mail and Passenger Lines



THIS MAP OF THE airlines of Canada was prepared by the Foreign Trade Division of the Department of Commerce. The growth of airlines in the Dominion has been from about 372 mi. in 1927 to 6,210 mi. as of Jan. 1. Under the encouragement of government contracts similar to those in this country the Canadian mail routes are expanding constantly.

AIRPORT CONSTRUCTION PROJECTS

West

RUNWAYS have been graded at Baldy Mesa (Calif.) Airport, and lighting equipment consisting of beacon, floodlights and runway markers are being installed. The port is an intermediate landing field on the Los Angeles-Kansas City route, and is located near Victorville, about 80 mi. east of Los Angeles.

Lighting has been installed at the Davis-Monthan Field, Tucson, Ariz., a 2,700x3,500-ft. port, which has three gasoline pumps at present and two more contracted for, and a 66x100-ft. hangar, which it is planned to enlarge soon.

Contract for the construction of a hangar at the new Klamath Falls (Ore.) Municipal Airport has been let to the Miller Construction Co. on their bid of $16,524.67.

Yuma, Ariz., has awarded the contract for construction of a concrete and steel hangar at Fly Field to C. W. Highfill, on a bid of $12,896.78.

South

Contract for dismantling, removal, and re-erection of an all-steel, $75,000 hangar from Little Rock, Ark., to Hensley Field, Dallas, was awarded to W. S. Crawford by the Dallas Chamber of Commerce. Work on concrete apron, foundation, and floors, costing $5,000, is nearly completed. Other construction includes erection of enlisted men's barracks and mess hall, and the conditioning of officers' quarters. The Army equipment and personnel now located at Love Field will be moved to new field as soon as construction work is complete.

All bids on new construction for the Shreveport (La.) Municipal Airport were rejected by the city council recently owing to the fact that the cost of the several buildings to be erected would exceed $100,000. More than $200,000 of the original $300,000 bond issue has been expended for the site and improvements, exclusive of buildings, it was announced.

Landing facilities at the Abilene (Tex.) Airport are to be improved and enlarged. It is planned to build a north-south runway, 2,000x100 ft., and to lengthen the east-west runway to 2,000 ft., building white shoulders on the sides for night visibility. Taxi strips are to be widened by 10 ft.

An oiled, crushed-rock runway, 100x1,000 ft., is being laid at the McGee-Tyson Municipal Airport, Knoxville, Tenn. The remainder of the field is being covered with waste oil. It had been planned to sow the port with grass, but the dust was so serious a nuisance that it demanded immediate action.

A new $75,000 brick and steel hangar is under construction by Magnolia Petroleum Co. at Love Field, Dallas. The structure contains 20,000 sq.ft. of floor space, and will be equipped with floodlights.

Austin, Tex., has appropriated $4,855 to build runways and construct a drainage system at Robert Mueller Airport, and $1,000 to be spent to condition 30 additional acres for use.

Recent improvements at the Hamlin (Tex.) Airport include the erection of a wind cone and the installation of a marker circle at the center of the field. The port has four 3,000-ft. runways.

The new 63-acre Augusta (Ark.) Airport has one runway complete, and two others under construction. All runways are to be 400x2,640 ft.

America's Playground, Inc., Jacksonville, is reported to have acquired a tract of 11,000 acres in Levy County, near the Gulf Coast, part of which will be used for an airport.

The airport commission of Greenville, S. C., has awarded the contract for installing lighting equipment at the municipal airport to Huntington & Guerry.

Danville, Va., has been authorized to establish and lease a municipal airport. The Dixie Flying Service has taken a 5-yr. lease on the field and a hangar, now under construction by the city.

Breckenridge, Tex., has voted to maintain a municipal airport.

A new municipal airport is under construction at Temple, Tex.

North Central

A county airport is being planned at Iron River, Mich., and R. C. Mahon has been appointed chairman of the board to supervise the selection and development of a site.

A tax levy of one mill has been made for airport improvements at Havre, Mont.

East

One hangar has been completed at the Harrisburg Airport, and work on the runways, to measure approximately 3,000x25 ft., is expected to be finished soon.

A fifteen-acre commercial airport is under construction on the shore of Otter Lake, near Old Force, N. Y., and a hangar is to be built shortly.

A group of business men of Smethport, Pa., is sponsoring a project to build and equip a 25-acre airport near the city.

A fifteen-acre commercial airport is under construction on the shore of Otter Lake, near Old Force, N. Y., and a hangar is to be built shortly.

A Whittredge portable, metal hangar is being completed at the Lowell (Mass.) Airport.

Northeastern Air Service has completed work on extension of runways at its New Canaan (Conn.) Airport.

Brower to Extend Line

OKLAHOMA CITY (OKLA.) — Plans for extension of the Omaha-Blackwell line of the Brower Air Service Corp. of Lindsborg, Kan., to Oklahoma City have been announced last week by H. F. Brower, president and manager. Service between Omaha and Oklahoma City was to have been started July 1 with new equipment.

Ohio Marker Beacon Working Satisfactorily

CLEVELAND (OHIO)—National Air Transport officials here announce the installation of a low-powered radio marker beacon, modulated to permit voice transmission, at the intermediate field at Vickery, O., between Sandusky and Toledo on the New York-Chicago airway. Installed by the Department of Commerce, it has a radius of 5 mi.

Normally the beacon functions as a routine marker beacon. On detecting the approach of a plane, however, or receiving voice signals from a plane through the loud speaker attached to the set, the airways keeper cuts out the marker beacon and goes on the air with the station name, the time, the weather and any other pertinent information or orders. If the plane is equipped with two-way voice apparatus, the pilot may give his name, the number of his ship and the designation of his run. The new beacon has been installed for two weeks and is working satisfactorily, according to N.A.T. officials.

Set Love Field Taxes

DALLAS (TEX.)—The city of Dallas has passed an ordinance seeking to provide sufficient income for maintenance of Love Field, the municipal airport. The plan is expected to bring in $16,500 revenue annually. A tax of $100 for the first plane and $12.50 for each additional plane used for flying instruction is to be levied and a $.01 tax per gallon is to be levied on gasoline vendors. Companies servicing their own planes must pay a blanket tax of $1,000 a year. There is some opposition among the operators.

Little Rock Leases Landing Field

LITTLE ROCK (ARK.)—This city has leased the U. S. Intermediate Air Depot landing field near here from White Bros. at a rental of $3,000 per year. In addition, the city agrees to keep the field in good condition and operate the lighting equipment which was installed by the War Department. White Bros. obtained a 5-yr. lease of the field in May on a bid of $200 per month. (See AVIATION, May 31 and June 28 for further details.)

Hodkinson Transports Adopted

GLENDALE (CALIF.) — Adoption of Hodkinson tri-engined transports as standard equipment on lines of Central American Aviation Corp., Ltd., has been announced by W. W. Hodkinson, president of Hodkinson Aircraft, Inc., of this city. A sesqui-plane, the Hodkinson machine is powered with three Curtiss Challengers, two of which are mounted directly on the lower wing. The craft carries seven passengers and is featured by a large de luxe cabin of full height.

Airway Briefs

Davis Airlines, Inc., operating between Atlanta, Ga., Anniston, and Birmingham, Ala., has been re-organized, with several personnel changes and minor revisions of schedule. Douglas Davis remains president of the firm.

Olympian Airways has announced plans for immediate opening of a New York-Boston passenger line, using Savoia-Marchetti S-55 flying boats on a schedule of two round trips daily. Landings are to be made at the foot of 51st St., New York, and at the Municipal Pier, Boston.

Pioneer Airways, Seattle, Wash., is about to inaugurate passenger service between that city and points in Alaska.

New Castle, Pa., will receive service on the Cleveland-Pittsburgh air mail line as soon as installation of an Adams air mail pickup is completed. Another pickup is to be installed at Beaver Falls, Pa.

T.A.T.-Maddux has added another section on the Wichita-Columbus division, and has added three men to the staff at Wichita.

Gulf Refining Co. has been awarded the oil and gasoline concession at McGhee Tyson Airport, Knoxville, Tenn. The company will pay the city one cent for each gallon of gasoline sold, and erect a $15,000 building which will contain rest rooms and a ticket office.

The Fort Worth (Tex.) Chamber of Commerce has declined to support the proposal made by the Chamber of Commerce of Dallas that Fort Worth should give up the Municipal Airport and use the landing field maintained by Curtiss-Wright near Grand Prairie, Tex., between the two cities.

City Airport Commission of St. Louis, Mo., has decided not to introduce a gasoline tax at Lambert-St. Louis Field for another six months.

T.A.T.-Maddux Air Lines and Yosemite Transportation System have inaugurated an air-rail-bus service from Oakland, Calif., to the Yosemite Valley. Passengers fly as far as Fresno.

Embry-Riddle Co., operating the mail and passenger line between Cincinnati and Chicago, has added a daily trip in each direction to provide better connections with rail schedules and with T.A.T.-Maddux at Indianapolis.

One Eastern Air Transport mail plane has been equipped with radio and placed in service on the New York-Miami route, and plans have been made for so equipping all of the company's planes.

Conrad Opens Tri-weekly Service

MINNEAPOLIS (MINN.)—Passenger service between Minneapolis, Rochester, Minn., and Winona, Minn., has been inaugurated on a tri-weekly scheduled by Conrad Flying Service of Winona. The company flies one plane each way on Mondays, Wednesdays and Fridays.

Open Syracuse-Elmira, N. Y. Line

ELMIRA (N. Y.)—General Aviation Co. inaugurated twice daily round trip passenger service between this city and Syracuse, June 9. Planes leave here at 8:30 a.m. and 5:00 p.m.; they leave Syracuse at 9:30 a.m. and 4:00 p.m. Single-engined cabin planes are used. The company, which is a division of Eastern Aeronautical Corp., ran a bi-weekly service over the same route last year.

Airport Dedications

The new municipal airport at Lincoln, Neb., was dedicated on June 21 and 22, with a program consisting of races, contests, and maneuvers by Army and Navy planes, sponsored by the local chapter of the American Legion. Approximately 7,000 persons attended the exercises.

Floyd Bennett Airport, New York City's municipal airport on Barren Island, Brooklyn, was dedicated by Rear Admiral Byrd June 26. The airport is far from finished but considerable grading and cement work on runways have been accomplished. It will not be opened officially for some time, probably early in 1931.

Other recent airport dedications include:

June 21, 22, Bella Vista Airport, Bentonville, Ark.

June 22, Titusville (Pa.) Municipal Airport.

June 23, Cortland County (N. Y.) Airport.

June 28, 29, Tyler (Tex.) Municipal Airport.

July 4, Temple D. Smith Field, Fredericksburg, Tex.

July 4, Rochester (Ind.) Airport.

T.A.C. Using Diesel Plane

DETROIT (MICH.)—The first Diesel-powered plane to be placed in daily scheduled passenger or mail operation was placed in service June 26 by Thompson Aeronautical Corp., operators of C.A.M. No. 27. The plane, a Stinson Detroiter, was flown over the company's Pontiac-Kalamazoo mail and passenger run by Forrest Kelch. The company plans to extend soon its Chicago-Kalamazoo night mail line to Detroit and Pontiac, at which latter city the company's operating base is located.

Fire at Omaha Airport

OMAHA (NEB.)—Fire destroyed a tool shed and threatened a hangar and several planes recently at the Omaha Municipal Airport, but attendants were able to save a fleet of 30 trucks used in improvement work on the field, which were being stored in the shed. Three tractors were damaged. The fire is blamed on an oil torch, used as a night marker at points where hazards are left during the work of installing new runways.

Weather Bureau Plans Expansion of Activities

WASHINGTON (D. C.)—Three new centers to which weather reports will be sent, and from which short-period forecasts of aviation weather will be sent out have been announced. These will be located at Atlanta; Dallas; and Portland, Ore.; they will supplement the present service from Cleveland; Fort Crook, Neb.; Salt Lake City. About 110 substations will report to these centers.

Effective soon after July 1, weather reporting service will be provided regularly covering about 13,000 mi. of airways. Teletype systems, giving hourly exchange of information 24 hr. a day, will be in operation over 8,000 mi., and the rest will be served by telephone and telegraph reports.

Observation from pilot balloons is to be provided at several additional points, including Albuquerque, N. M. Cincinnati; Dallas and Del Rio, Tex.; Elko, Nev.; North Platte, Neb.; Nome and Fairbanks, Alaska. There is to be general increased service in Alaska and the Hawaiian Islands, in the latter case with a chain of island stations transmitting information by radio to Honolulu. In addition to these activities, the Weather Bureau is continuing research in such problems as ice formation on aircraft, turbulence or gustiness, and other problems.

Japanese Plan Pacific Airship Line

AKRON (OHIO)—That there may be a race between Akron and Japanese interests to be first in the field with commercial airship service across the Pacific, is seen in an announcement at San Francisco that a $15,000,000 Japanese company, already financed, expects to be operating a 68-hr. San Francisco-Tokio Zeppelin service before the autumn of 1931. The announcement was made by Toyoji Keneko, acting consul general of Japan, who said the Japanese company already has started negotiations for purchase of three dirigibles costing $1,500,000 each. Acquisition of a large tract of land near Tokio recently was authorized. Goodyear-Zeppelin Corp. officials here say that to the best of their knowledge no such dirigible orders have been placed with either Akron or German Zeppelin companies. There is no other company equipped to produce the ships.

Order New Mast for Lakehurst

WASHINGTON (D. C.)—The Navy Department has awarded a contract for construction of a new mobile airship mooring mast to McKay & Kirkland, Baltimore, Md. The new mast, which will cost $13,498, is to be similar in general design to the portable mast recently placed in service, and it will also be used at Lakehurst. It is to be capable of handling the new ZRS-4 now under construction at Akron, Ohio.

Fires Break Out At Chicago

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only along the Sixty-Third Street side of the field, which fortunately was the side where the fire occurred. However, it was necessary to lay out some 12,000 ft. of hose to obtain sufficient water to handle the situation adequately.

More planes in the Stout hangar might have been saved had it not been for the fact that a Sikorsky demonstrator was across the doorway of the east unit. An attempt was made to start one of the tractors, but it failed to function. It was found impossible to roll the craft out of the hangar with the number of men available. At the last moment, a tow truck was found and the plane hauled out of the blazing structure. One of the Universal mechanics expressed the opinion that wider hangar doors would have meant saving some of the Universal planes in the east unit.

The Universal hangars and machine shop had brick side walls, but the roof was entirely of timber. The Stout hangar likewise had brick walls, but its roof was supported by steel trusses. Neither building was equipped with a sprinkler system, although both had the usual number of hand fire extinguishers and chemical carts. The flames spread so rapidly that this equipment was of no value whatsoever, according to eye witnesses.

Pal-Waukee Fire Controlled

Twelve planes in the 60x105-ft. sheet metal hangar at Pal-Waukee Airport were imperiled by the fire which broke out there July 27, but were saved by quick action of the night watchman, Edward Erickson. There were about 40 planes at the field at the time, but the distance between the hangars is so great it is not likely that they would have been endangered even though the sheet metal hangar was destroyed.

The story told by the night watchman is that at about 2:45 a.m. a man drove into the airport grounds in an automobile. He said that he was having trouble with the distributor of the car and asked if he might work on the Tarvia apron between the wooden and sheet metal hangars and the new club house-administration building. There was illumination at that point from the lights on the wind cone. The watchman stayed with the man for about 10 min., when it came time for him to punch the clocks in the other hangars. Completing this duty, he returned to the metal structure to find that the man and the automobile were gone and that there was a fire inside the building.

As soon as he entered the hangar Erickson saw the right wing of a Stinson monoplane owned by The Texas Company in flames. He succeeded in putting out the blaze with a hand fire extinguisher before the fabric of the fuselage became ignited and before the fuel tank in the wing exploded. The right wing tank was about half filled with gasoline.

Owen B. Jones, president of Pal-Waukee Airport company, made an inspection of the plane that day. He reports that the fabric of the right wing was completely consumed, but from the appearance of the ribs it looked as though the plane had been fired from the trailing edge. He thought at first that the fire might have been caused by a short circuit in the wiring to the running lights on the wings, but his inspection revealed the fact that there was no battery in the plane at the time the fire occurred. The Cook County Highway Police are said to be much interested in the case.

Apache Airlines Announces Plans

GLOBE (ARIZ.)—According to a report recently issued by Lieut. R. G. Vaughn, general manager, more than 1,800 paid passengers have been carried over the Globe-Miami-Superior-Phoenix route of Apache Airlines since its inauguration in November, 1929. Apache Airlines operates two tri-engined Kreutzer six-place cabin monoplanes powered with LeBlond 90 hp. engines. The route is approximately 100 mi. in length from the Midland Airport, which serves the towns of Globe and Miami to the Sky Harbor, Phoenix, with a flag stop at Superior. Midland is at an altitude of 3,500 ft. and it is necessary for planes to fly at altitudes of more than 8,000 ft. in order to top the mountains between Globe and Phoenix. Patrons of this line have largely consisted of mining company executives and of traveling salesmen who must visit the many mines in this territory, which is poorly served by rail and bus lines. Planes leave Midland Airport at 8:10 a.m. and 4:10 p.m. each day arriving at Sky Harbor, Phoenix at 9 a.m. and 5 p.m. Departures from Sky Harbor are scheduled for 9:10 a.m. and 5:10 p.m., daily, with arrivals at Midland Airport at 10 a.m. and 6 p.m.

P.A.A. Make Changes In Routes and Schedules

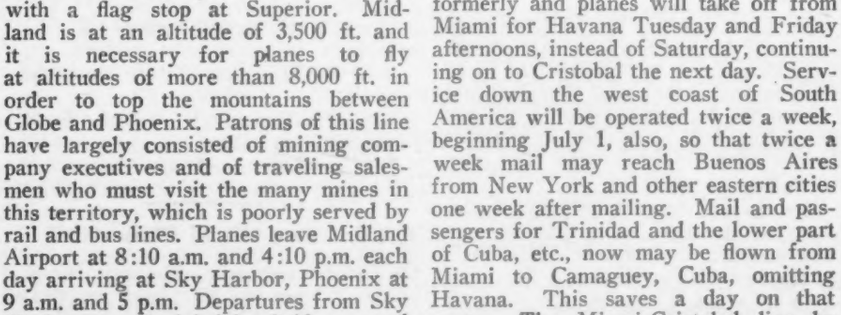
NEW YORK (N. Y.)—Pan American Airways has announced a number of changes in its service. The chief of these is the inauguration June 25 of northbound mail service along the east coast of South America, an extension of its present Miami-Paramaribo line to Rio de Janeiro line and a step which has been in prospect for some time. This marks the completion by that company of an almost complete airway circle around the continent and a bid in the field already operated by New York, Rio & Buenos Aires Line and to some extent by Aeropostale.

This new leg is about 1,800 mi. long, and brings the total of airways operated by the company to 18,217 mi. The Rio service is being operated under a contract with the Brazilian government and mail is carried on the northbound trip only. Southbound mail to Rio may be carried by Pan American only as far as Paramaribo, the terminal under the present contract with the United States. No United States contract for service along the east coast has been let as yet. The service will be operated weekly.

Other Arrangements

Other changes, effective July 1, include the following: The direct Miami-Cristobal mail service will be flown from Miami twice a week instead of once a week as formerly and planes will take off from Miami for Havana Tuesday and Friday afternoons, instead of Saturday, continuing on to Cristobal the next day. Service down the west coast of South America will be operated twice a week, beginning July 1, also, so that twice a week mail may reach Buenos Aires from New York and other eastern cities one week after mailing. Mail and passengers for Trinidad and the lower part of Cuba, etc., now may be flown from Miami to Camaguey, Cuba, omitting Havana. This saves a day on that route. The Miami-Cristobal line by way of Belize has been shortened by one day of flying also.

New Curtiss-Steinberg Airport at St. Louis



SHOWING THE present plant at Curtiss-Steinberg. Note the three hangars in conventional Curtiss style and the cement runways, aprons and walks.

FOREIGN ACTIVITIES

French Company Plans Marseilles-Saigon Service

PARIS (FRANCE)—Inauguration of an airline between Marseilles and Saigon, Indochina, next Jan. 1, is planned by Compagnie Air-Union-Lignes d'Orient. This decision was made following a successful round-trip in a Farman 190 with 230 hp. Gnome-Rhone-Titan engine made recently by the director of the company, M. Allegre. The route is to be divided into three sections: Marseilles - Bagdad; Bagdad - Karachi; Calcutta - Saigon. Weekly service is already furnished over the first section, with Cams seaplanes using twin Hispano-Suiza engines from Marseilles to Beyrouth, motor buses from Beyrouth to Damascus, and Breguet planes from Damascus to Bagdad. Reduction of this schedule from three days to 48 hr. was recently announced.

According to present plans, Farman three-engined planes will be used between Bagdad and Karachi. At first, passengers and mail will be carried by rail across India to Calcutta, and from there by Cams seaplanes to Saigon, by way of Rangoon. When the service is started, the Bagdad-Saigon route will be covered twice a month. This will mean a considerable saving, even so, as it takes 24 days to travel from Marseilles to Saigon by boat, and by air and rail as planned the distance can be covered in twelve days. Later this will be reduced to eight days when India is crossed by air and the schedule is otherwise speeded up.

Reduce Avro Avian Prices

LONDON (ENGLAND)—The standard Avro Avian with wooden fuselage and Cirrus II engine now sells for $2,775, as a result of reductions recently announced by Henlys, Ltd., agents for Great Britain. With the Cirrus III engine, the price is $2,890, the same as the standard Gipsy Moth, on which reductions were announced about two months ago. The Avian Mark IV M with metal fuselage and Cirrus Hermes engine is priced at $3,875, and the special Sports Avian with Hermes engine sells for $4,050.

Redwing Uses A.B.C. Hornet

LONDON (ENGLAND)—Robinson Aircraft Co., Ltd., has introduced the "Redwing", a two-place unstaggered biplane with side-by-side seating arrangement. It was designed by John Kenworthy. The position and small size of the horizontally opposed 4-cyl. 75-hp. A.B.C. Hornet engine gives excellent visibility, helped by a high upper wing.

Extend Moscow-Irkutsk Line

MOSCOW (U.S.S.R.)—As a result of recent successful experimental flights, the daily mail service to Irkutsk is hereafter to be flown on to Khabarovsk on alternate days. This extension of about 1,700 mi. brings the air mail line within less than 500 mi. of Vladivostok. Recently a flight from Moscow to Khabarovsk was made in 41 hr., while the distance takes ten days over the trans-Siberian railway. The service will be continued until November 1. Mail from eastern Siberia and China destined for Europe over this route is charged a surtax of about $0.87 per ounce for letters, and $0.35 for postcards.

French Claim Seaplane Marks

ST. LAURENT (FRANCE)—Four International seaplane records were claimed by Lieut. Paulin Paris of the French naval aviation section after a flight lasting 20 hr. 20 min. on June 21-22. Covering 2,853 km. (1,771.7 mi.), he broke the distance record for planes with 1,100-lb. load, as well as with the 2,200 lb. the plane actually carried. The former records in these categories were held by Americans, Connell and Roodd, and Corton and Boatswain, respectively, both in the PN-10. Lieutenant Paris also claims the duration record for seaplanes carrying 2,200 lb., and the speed record in this category over a 2,000 km. course, with an average of 146.76 km. per hr. (91.13 m.p.h.). These were also formerly held by an American PN-12. Information as to the type of plane, used by Lieutenant Paris and the results of further record attempts is not available as this issue of AVIATION goes to press, but will be published later.

Jugoslav Co. Runs Four Lines

BELGRADE (JUGOSLAVIA) — The Jugoslav National Aviation Co. is now operating four airlines for passengers and freight, as follows: Belgrade-Zagreb-Graz-Vienna; Belgrade-Uscub-Salonika; Zagreb-Souchak; Belgrade-Sarajevo-Podgoriza. The first three are flown daily except Sundays; the last is flown on Mondays and Thursdays. Passenger fares are about $.05 per mile, or somewhat less, depending upon the line. The fare from Belgrade to Vienna, a distance of about 435 mi. as flown, is $21.75 at present exchange. Each passenger is allowed 33 lb. of baggage. Freight tariff over the same route is $2.17 per kilogram, or about $1 per pound. All of these lines began operation on the present schedules May 1 except that between Zagreb and Souchak, which was scheduled to start July 1.

Entry List for King's Cup Includes 96 Planes

LONDON (ENGLAND) — Ninety-six planes are entered in this year's King's Cup Race for civilian aircraft, which will be flown July 5 over a 750-mi. course. As might be expected, nearly half are DeHavilland Moths; 36 standard models, nine Puss Moths, and one Hawk Moth. The Blackburn Bluebirds and Avro Avians are numerically next in the list. There are several distinctly new types, such as the Segrave Meteor, Hawker Martlet, Arrow Active, Robinson Redwing, and Hendy Hobo. Gipsy leads the engines with 53, and Cirrus is next with 28. Since the race is to be flown this year in one day instead of two, planes will be handicapped at a minimum speed of 80 m.p.h.

The public has showed great enthusiasm because the Prince of Wales and Prince George have entered planes, although neither of Their Royal Highnesses will actually participate in the race. Among the well-known pilots who will compete are: Flt.-Lieut. R. L. R. Atcherley, the Hon. Lady Bailey, Capt. H. S. Broad, Col. The Master of Sempill, Flt.-Lieut. H. R. D. Waghorn, Miss Winifred Spooner, Capt. G. DeHavilland, Sq.-Ldr. A. H. Orlebar, and H. N. S. Norman.

C.I.D.N.A. Buys Czech Planes

PRAGUE (CZECHOSLOVAKIA) — Compagnie Internationale de Navigation Aerienne (C.I.D.N.A.) has accepted delivery of several planes built by the Aero company here. These are the model A38, cabin biplanes for eight passengers and two pilots, using a single Jupiter engine, and have already been tested on the Czechoslovak line, Csl. Statni Aerolinie. Among the interesting features is the cabane mounting of the upper wing, well above the cabin. The fuselage is of riveted steel tube construction. The upper wing has a span of 55 ft., and the lower, 50 ft. There is no stagger. Gross weight is 7,200 lb., and the cruising speed is 105 m.p.h., with a range of about 400 mi.

Mexico Taxes Transport Planes

MEXICO CITY (MEXICO)—Under a decree issued by President Rubio, a new schedule of taxes for commercial planes operating in Mexico has been placed in effect. The rates are: planes with pilot and one passenger, $2.50 per day; two to four passengers, $5 per day; four to ten passengers, $7.50 per day; over ten passengers, $10 per day.

Hispano-Suiza Offers Two Improved Engines

PARIS (FRANCE)—Two new Hispano-Suiza engines represent interesting developments from previous types. The 12 Mc, with a nominal rating of 500 hp., is very similar to the former 12 Mb, but has a compression ratio of 7 instead of 6.2, and the weight has been reduced from 880 to 835 lb. By these changes, and by increasing the r.p.m. from 2,000 to 2,200, the maximum horsepower has been stepped up from 580 to 650. In overall dimensions, the new engine has been kept small enough to be interchangeable not only with the 12 Mb, but with the earlier 400 hp. 12 Jb.

A second new Hispano-Suiza engine is the 12 Nbr, derived from the 12 Hbr. In this case, the nominal horsepower has been increased from 500 to 650, with an increase in weight only from 1,010 to 1,100 lb. Maximum horsepower is advanced from 590 to 740, while the compression ratio remains at 6, and the r.p.m. at 2,000, with 2:1 gear reduction. Both of the new engines are characterized by an increased use of electron for parts which do not carry heavy stresses. Like the previous models, both are 12-cyl., watercooled.

Foreign Briefs

Frederick Koolhoven has designed and built a new parasol monoplane trainer, using a Cirrus Hermes 110 hp. engine, with several novel characteristics. The landing gear and bracing are similar to those of Desoutter coupe, which Koolhoven helped to design.

The Italian aviators Maddalena and Cecconi have been credited with an international closed circuit distance record of 8,200 km. (about 5,085 mi.) in addition to the non-refueling endurance record of 67 hr. 15 min.

Sir Walter Nicholson has resigned his position as Secretary of the British Air Ministry, effective next fall, and C. L. Bullock, principal private secretary to the Air Minister, has been appointed to succeed him.

It has been reported that the German Luftshiffbau Zeppelin firm is negotiating the purchase of a tract of land at Giquia, Brazil, for a permanent landing field.

Vacuum Oil Co. of Australia has purchased an Australian-built Moth plane.

Lloyd Aero Boliviano, air transport company of Bolivia, has paid 5 per cent dividends for 1929. There were 2,153 flights made, 8,532 passengers and about 271,000 lb. of mail, baggage and freight carried. The number of miles flown was about 295,000.

Ecole Superieure de l'Aernautique, Paris, has been placed under Government supervision, and will hereafter be known as Ecole Nationale Superieure de l'Aernautique.

Under agreements made at the London postal conference, the Mexican Government has inaugurated air mail service to Europe, Asia, Africa. The mail goes by air to New York, then by boat to France, and by air to its destination. The rate to Europe is $0.25 for 20 grams, or about $0.40 per ounce. A similar service has been established to other Latin American countries, but the rates are higher in most cases than the rates to Europe.

A full regiment of the Mexican Army Air Force, consisting of 32 planes, engaged in maneuvers near Mexico City July 1. Heretofore not more than nine Mexican planes have attempted simultaneous maneuvers.

In accordance with President Rubio's order forbidding Mexican military aviators to engage in long-distance flights, Col. Roberto Fierro was prevented from continuing his New York-Mexico City flight by another hop to South America, as he had originally planned.

Aviation experts from European countries, the United States, and Brazil will meet at Geneva July 8 for a conference on world airways, under the auspices of the League of Nations.

There were 1,766 passengers who left Budapest by air during 1929, and 1,599 who arrived. Hungarian air traffic for the year showed an appreciable recession from 1928.

Planes operated by Danish Aviation Co., Ltd., flew 96,200 mi. in 1929, as compared with 92,100 mi. in 1928. On regular trips, 1,740 passengers were carried as compared with 1,602, while passengers on taxi flights showed a loss from 992 to 790. In 1929, 34,500 lb. of freight, 52,400 lb. of baggage, and 10,900 lb. mail were carried, totalling about the same as the previous year.

French Hold Meet at Vincennes

VINCENNES (FRANCE) — Most of France's prominent pilots, including Sadi Lecointe, Bossoutrot, Detroyat, Lotti, and Mlle. Lena Bernstein, participated in the National Aviation Days here June 8-9. Displays of acrobatics and of new and old types of planes were highly interesting, but the races were somewhat disappointing. Among the new machines shown publicly for the first time were the DB 70, the Potez 38 commercial plane, the twin-engined Wibault, Caudron 232 touring plane, LeO 23 amphibion, Potez 36 touring plane with "Safety leading edge," all of which have been described in AVIATION. Of special interest among the older planes was a pre-war Deperdussin monoplane piloted by Prevost, who won the Gordon Bennett Cup in 1913 in a plane of the same make.

Claim Light Plane Records

BERLIN (GERMANY)—Dispatches received here indicate the breaking of three International records for light planes. Arpad Lampich, a Hungarian, claims to have broken his former closed circuit distance record of 321.3 mi. in a plane of the second category by a flight of about 620 mi. over the Budapest-Maron course. The Junkers Junior with pontoons, which recently set five new marks, has now also made an endurance flight of 16 hr. 20 min. with a passenger, and a flight of about 1,200 mi. over a closed course. On the endurance test, an average speed of about 102 m.p.h. was maintained.

Inside the Wing of the Junkers G. 38

SOME IDEA of the size and internal structure of the wing of the Junkers G. 38 monoplane may be obtained from this photograph. The catwalk is provided for access to the engines, which are carried in the wing, and the gasoline tanks. This is the world's largest landplane designed for carrying passengers, and will accommodate more than 45 persons.

WHAT OUR *Readers Say*

Learned or Taught?

[It is a privilege to present herewith another communication from Brigadier General Frank P. Lahm in charge of the training activities of the Air Corps and himself a pilot of twenty years' standing. General Lahm's remarks are called forth by our editorial "Is Flying Learned or Taught?" in AVIATION for April 12, 1930.—ED.]

TO THE EDITOR:

Again you have called my attention to an article on training which is my first interest, and I give you herewith my reaction.

Flying is both learned and taught. Responsibility rests on the student for learning and on the instructor for teaching. Many students come to the Air Corps Training Center who are mentally far above the average, some brilliant, but they do not all qualify as pilots. They can analyze maneuvers and can understand the instructor's explanation, but are unable to execute what they attempt to do. They lack coordination, cannot learn to differentiate between correct and incorrect flying and cannot acquire the feeling of flight sustentation which we term "lack of inherent flying ability."

But the article you refer to deals primarily with the instructor and I agree with your conception of his qualifications. We have come to that conclusion in developing our large corps of flying instructors, of which we are now using approximately one hundred in the two Air Corps Primary Flying Schools where the "airplane pilot" is developed before going to the Advanced School to become a *"military* airplane pilot."

Realizing the importance of having only qualified flying instructors, shortly after the organization of the Training Center in the summer of 1926, a flying instructors' school was established with this object in view. The idea was to develop instructors who were not only thoroughly competent to perform the various maneuvers, to analyze them, to present them in a clear and easily understood manner to the students, but also to weed out the ones who did not have the necessary qualities of patience and a sympathetic attitude toward the student. Another object of the flying instructors school is to standardize methods of instruction so that the same would be used by the instructors of both primary schools. There is always at tendency for different methods, different schools of thought, to spring up in the two primary schools which are separated by some twelve hundred miles.

After much thought and discussion by the most competent flying instructors then available in the Training Center, a manual for flying instructors was produced and published for the use of the individual instructors. You will note that this manual is not furnished the students.

An effort is made to remove the mystery from flying by a thorough explanation of the function of the airplane and the effect of various controls and surfaces of the airplane. Before being taught the various maneuvers, the student is given a thorough explanation as to how the controls are used and their effects on the airplane in various positions and at various speeds. This can be done only by a competent flying instructor and it is believed that the students learn largely in the first part of the instruction by imitation of their instructors. It is only after they have acquired a certain amount of proficiency in the various maneuvers that they are able to analyze them and the method of execution.

As I stated in my previous letter to you, flying instructors must be psychologists to a certain degree. They must be able to analyze the students, recognize the different characteristics of the students, and be prepared to exercise patience with the timid ones, with the ones who lack self-assurance, or who have a natural and inherent fear of flying (although they may not themselves realize it). The flying instructor must be able to suppress the over-enthusiastic and daring student who is inclined to attempt maneuvers which neither he nor the airplane is capable of performing.

It is interesting to note in confirmation of your article that some excellent pilots who have all the technique that could be expected fail to qualify as flying instructors. It is even more interesting to note that men who were rated as weak flyers when they were students in the Air Corps Training Center and some who even now are not classified as highly expert in technique, have turned out to make very good flying instructors.

To sum up, flying should be "taught" by an instructor who is qualified in accordance with the description I have given above, but the student must "learn" to a limited extent by imitation in the beginning and finally by the exercise of initiative on his part.

F. P. LAHM,
Brigadier General, A.C.,
Duncan Field,
San Antonio, Texas.

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The OX Engine

TO THE EDITOR:

I noticed in the article in AVIATION, May 31, by Mr. Nelson Story, suggesting the junking of all OX engines, that he asks for others' opinions on the matter. Anyone who do not have to fly anything but "Whirlwinds," is fortunate indeed, but he should not try to compel every one else to do likewise.

As far as reliability is concerned, the Department of Commerce does not jump at conclusions, neither does it license anything that is unairworthy. As soon as the OX starts killing all the flyers off, the Department will check up on statistics and put a stop to things. If anyone is wide awake, the Department of Commerce is.

There are hundreds of thousands of dollars worth of brand new OX parts and motors left, which will do a great deal to help aviation along, and as far as war time motors are concerned, N.A.T. is certainly hauling a lot of mail and valuables with them. (Liberties). If the OX is not suitable for high altitude work, don't use it, but it seems to get along nicely here.

There are eight OX jobs on a certain field here, and usually more, and I do not know of a single forced landing within the last year due to mechanical failure, but there were four forced landings with aircooled engines. Three were caused from broken cylinders and one by a broken carburetor body.

The idea of junking so much expensive equipment is somewhat ridiculous. Within two or three years the industry will be producing planes to use the aircooled engines of around 100 hp. for less than the OX jobs sell for now. It would be just about as practical to junk the OX as it would to say—Let's throw away all the Fords and Chevrolets and drive nothing but Cadillacs and Lincolns.

ROY E. JOHNSON,
Ashburn Field,
Chicago, Ill.

Editorial Comment

FROM THE DAILY PRESS

The Mail Pilot's Skill

THE SKILL and hardihood of the pilots who fly the air mail are almost beyond belief, sometimes.

Not long ago Pilot Robert P. Hopkins, flying a National Air Transport plane from Chicago to Cleveland with a heavy cargo, met a heavy fog bank when he arrived over Cleveland. The

fog was so dense that he could not find the airport, and he circled helplessly for an hour and a half.

At last he made out a bit of the lakefront. Circling low, he spied a city park, with a little open space in the center. Down he came—to make a safe landing on a patch of lawn so small that in the morning it was necessary to take the wings of the plane off to get it out through the trees.

Skill like that hardly needs any comment. No wonder the air mail fliers are considered the aristocrats of the air!—PORTLAND (ORE.) NEWS.

Abstracts AND *Reviews*

Fog and Night Flying

BLIND FLYING; *article in "Deutche Luft Hansa Nachrichten," Dec. 15, 1929.*

THE "Deutche Luft Hansa Nachrichten" for Dec. 15, 1929, contains an article referring to the ever increasing importance of blind flying in air transportation. It mentions the dangers of collision and the difficulty of finding one's way and of landing in fog. It calls particular attention, however, to the general obscurity regarding the fact that a pilot in fog has no sense of equilibrium. This is caused by the addition of the forces of acceleration caused by the movement of the plane, to the forces of gravity. A pilot feels the resultant of these forces, but it is impossible for him to judge from this the position of his plane in relation to the earth's surface.

The article also refers to tests made at the "Ila" (International Airplane Exhibit) in 1928 by the Askania Works. A completely inclosed chamber was made so that it could be turned, and was equipped with instruments. People on whom tests were made found that the indication of the instruments in no sense agreed with the "positive" sense of direction which they had.

Various instruments used in blind flying are mentioned, including artificial horizon, turn indicators, and others which are in use or in a stage of development. Among the latter are gyroscopic instruments for indicating direction in a longitudinal sense and are combined with the turn indicators; and the so-called variometer indicating the rise and fall of the plane. One of the suggested solutions of the fog flying problem is the development of "automatic pilots." Experiments to improve blind flying equipment were begun in Germany as long ago as 1925.

For instructing the pilots of the Luft Hansa a dummy plane with instruments is used which the pilot must control under the direction of a teacher. After this instruction on the ground, the pilot goes up in a plane in which the seat is entirely enclosed so that he cannot see, while the instructor sits next to him in an open cock-pit and can converse with him by means of speaking tubes. The instruction is continued on various types of planes and finally the pilot must fly blind over a given course satisfactorily and must also be able to make turns both to the right and to the left with safety. This special training is now given to all Luft Hansa pilots.

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Observation Plane

THE WEYMANN-LEPERE W.E.L. 10 OBSERVATION AIRPLANE; *A High Wing Monoplane; N.A.C.A. Aircraft Circular No. 107.*

THIS CIRCULAR refers strictly to the structural details of the Weymann-LePere W.E.L. 10. Interchangeability is emphasized throughout with the thought of advancing the product to the industrial stage. The wing covering is made of narrow metal sheets corrugated longitudinally. When the distance between successive ribs is too large, stiffeners are fastened to the outside surface of the covering in the direction of air flow. The wing itself consists of separable box sections strung on spars and fastened by riveting. These box sections incorporate the covering with a leading and trailing edge and two bulkheads. The covering withstands stresses parallel to the plane of the wing and the torsional moments. The spar is subjected only to forces parallel to its web. A retractable radiator is fitted in a slot in the rear portion of the wing. It is claimed that this reduces the aerodynamic efficiency a negligible amount. The fuselage is built in three sections. The first section includes the engine and accessories, the second includes the cabane and pilot's compartment, and the latter extends from aft of the pilot to the tailpost. The structure consists of four longerons with diagonal bracing and a covering which stiffens the entire unit.

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Light Monoplane

THE COMPER C(LA)7 "SWIFT" AIRPLANE, *Light Single Seat Monoplane; N.A.C.A. Aircraft Circular No. 108.*

THE COMPER "Swift" is a low powered, low priced single seat monoplane of the high wing type. Good vision has been secured by placing the pilot in back of the wing so that his eyes are on a level with the trailing edge. This necessitated placing the engine a considerable distance forward and using large tail surfaces. The engine is an A.B.C. "Scorpion" mounted on special vibration absorbing units. The fuselage has a clean streamlike form and is built up from a light wooden girder, fabric covered. It is claimed that this construction is strong and requires no truing up after extended periods of use. The wing is built in three sections, the narrow center section being integral with the fuselage. Spars and ribs are of spruce. The wings fold so that the airplane, in itself quite small, occupies a very small space indeed when folded. The nine gallon capacity gasoline tank is of the gravity feed type and is located in the deck fairing aft of the engine. A partition in the tank separates one gallon from the rest for reserve. The monoplane wing rests on a narrow portion of the fuselage and is supported by two pairs of V struts. The aerodynamic design is very clean and well thought out.

New Patents

Airplane

1,758,498. Vincent J. Burnelli, Lincoln, Neb., assignor to R. B. Patent Corp., New York, N. Y. Filed January 6, 1921. Serial No. 435,481.

FULL POWER EQUIPMENT and useful load entirely enclosed in the body portion of an aircraft, and this body portion being in the shape of an airfoil, is the subject of this patent. The fuselage is of greater width than the average and has two engines mounted in the "leading edge." The two motors are on the same axis and their relatively close position gives but a small turning moment when only one engine is running. The patent covers the forms of construction and trussing.

Seven claims are enumerated with advantages for each. It is claimed that the wide type fuselage allows the construction of a landing gear with wider tread.

THE BUYER'S LOG BOOK

This Log is prepared by the editors of AVIATION *purely as a service to readers. All items are published free of charge, solely on their news value, and without any advertising consideration whatsoever. Manufacturers are invited to send in material for this section.*

Brunner Painting Outfit

RECENT ADDITIONS to the line of the Brunner Manufacturing Company, Utica, N. Y., are the Model 700P portable spray painting outfit and the Model 800P portable tire inflator. The painting unit, which is equipped with a ⅓ hp. motor operating from the ordinary light circuit, is recommended by the manufacturers for touch-up and repair painting on aircraft and general light duty service around factory and hangar.

Model 700P portable spray

The tire inflator is useful in small hangars and will compress to 150 lb. pressure, inflating any size tire. The air is filtered through the trap between compressor and hose on that only clean dry air is able to enter the tire. With this model is furnished 20 ft. of electric cord and a 25 ft. hose line permitting operation in a 90 ft. circle.—AVIATION, *July 5, 1930.*

U. S. Low Pressure Tire

LOW PRESSURE AIRPLANE TIRES in a complete range of sizes are now produced by the United States Rubber Co., Detroit, Mich. Web cord construction and flat band building are used in the manufacturing process to give the greatest strength with minimum weight. According to company announcement, these tires make landing easier and permit flying from soft and muddy fields with safety.—AVIATION, *July 5, 1930.*

Laidlaw Hydraulic Feed

WILLIAM LAIDLAW, INC. of Belmont, N. Y., has recently developed a new low pressure hydraulic feed for use in connection with the Laidlaw line of metal cutting band saws. The feed consists of the following parts: A small rotary type piston pump, oil reservoir, pressure regulating valve, relief valve, pressure gauge, cylinder, piston, control valve and the necessary piping to conduct the oil from the reservoir through the pump and cylinders and back to the reservoir. The pump, reservoir and all piping except the short flexible metallic hose connections to the cylinders are housed in the base of the machine, the pump being directly coupled to the main drive shaft.

A saw of the double cutting type necessitates the use of two cylinders and the necessary piping to connect them to the system. Otherwise the feed is the same as used on single cutting machines. The manufacturer states that about 50 lb. per sq.in. is the pressure required for ordinary cutting, but provision is made whereby a pressure of 100 lb. can be obtained if desired.—AVIATION, *July 5, 1930.*

Hyro Industrial Furnace

THE Hyro Manufacturing Co., Inc., has recently introduced an automatic industrial furnace for case hardening by cyanide and salt bath processes. The furnace and quenching tank are self-contained, each covered by a hood, and the hoods are joined by a sealed passageway. The work is fed with a scoop into a basket which is submerged in the hardening solution in the pot. One of the special features is a carrying mechanism which moves in a semi-circle within the hoods and sealed passageway. Products of combustion and poisonous fumes from the hardening solution go up the flues and their escape into the shop is thus prevented, as well as the possibility of spilling the boiling liquid outside the hoods. According to the manufacturer, the process requires slight manual effort and one man can operate two or more furnaces.—AVIATION, *July 5, 1930.*

"Thermo-Pete" Oil Heater

A PREHEATING element called "Thermo-Pete" for installation on radial and OX-5 engines has recently been placed on the market by the Aviation Accessories Corporation, Moline, Ill. The 300 watt Thermo-Pete operates in 1 to 3 gal. of oil, and 500 watt in 3 to 8 gal., the 750 watt in 8 to 15 gal. and the 100 watt in 15 to 20 gal. This element can be used only on 110 volts and the oil should not be drained with Thermo-Pete connected. — AVIATION, *July 5, 1930.*

New Ignition Terminal

AN INNOVATION IN IGNITION TERMINALS has just been announced by the Tiffany division of the Connecticut Telephone & Electric Corp. of Meriden, Conn. It is a locking spark plug cable terminal of unusual construction. Powerful phosphor bronze jaws of the terminal make perfect contact with the spark plug and the contact is then locked by a hinged bale which swings down across the end of the terminal. Its grip is made to withstand violent air maneuvers, rough landings, sudden propeller blasts and engine vibration. In service the terminal may be removed as quickly as the ordinary kind. A special Bakelite dilecto affords insulation under extremes of operating temperature.—AVIATION, *July 5, 1930.*

Trade Catalogs

►*Lunkenheimer Aircraft Specialties.* The latest edition of the "Lunkenheimer Aircraft Specialties Catalog" has just been issued, showing among other features a new aluminum strainer and a line of aircraft type primers.

►*Piston Rings.* The 1930 edition of the Piston Ring Specification Book published by the American Hammered Piston Ring Co. is now available.

► *New Curtiss Falcon.* Performance and specifications of the 1930 Curtiss Falcon are featured in a colorful folder lately issued by the Curtiss Aeroplane & Motor Co. A list of standard equipment, photographs of the plane and a three-view drawing are also included.

Revolution Indicator

THE VEEDER-ROOT COMPANY, Hartford, Conn., is now manufacturing an engine revolution indicator to be permanently attached to the engine and having for its purpose the recording of the total number of revolutions made. It is geared and calibrated to show directly the number of hours of operation at full speed and thus gives a check on the life of the engine and the time between overhauls. The revolution counter is furnished in an aluminum case.—AVIATION, *July 5, 1930.*

Veeder-Root revolution indicator

SIDE SLIPS

By
Robert R. Osborn

ACCORDING to the papers, Mr. R. Turner, who has been making a series of high speed trans-continental flights, is looking into the possibility of a high speed mail and express line to cross the country in from eighteen to twenty hours,—"Planes used in the service, he said, would be equipped with huge parachutes hidden in the wings and that they also would carry radio apparatus and machine guns to ward off possible robbery attempts."

This is just another proof that this machine age is taking the romance out of life. Instead of machine guns, why couldn't they have a bewhiskered, grim-visaged gentleman, armed with a sawed-off shotgun and a chew of tobacco, riding right alongside of the pilot?

• • •

New York turned out to give Admiral Byrd the rousing welcome he deserved. We can claim, too, that we called his attention to one little detail which at least helped to make his reception more enthusiastic than ever before. You may remember that after his North Pole flight the New York *Times* came out with the vastly disappointing news in large type across the front page "Byrd Sees No Life Nor Seals." This, of course, was a great blow to our people, who had thought that the Commander could be relied upon to bring home either life or seals to our waiting firesides. When he started out this time we warned him that if he neglected this vital matter on this South Polar trip, the crowd which turned out to welcome him probably wouldn't be more than three or four hundred thousand. When the reports came through that he had found penguins living on the ice, a vast sigh of relief was heard throughout the land and we all have welcomed him home with open arms and keys to the country. We can expect, any time, to hear that Senator Borah has charged that Admiral Byrd had taken the penguins down with him, but this will not shake the hold of the Admiral in the hearts of the people. Life, if not seals, has been found, and Antarctica is safe for Democracy.

• • •

There was one part of the report of the Byrd welcome in the *Evening Post* which must have brought a cheery smile to the faces of a large group of radio listeners: "Graham McNamee, broadcasting the spectacle of the marine pageant, was suffering visible tortures as the din tore at his ears."

• • •

OUR HANGAR FLYING DEPARTMENT

The following story comes to us from R.H.D., Jr., who claims it has gone the rounds of everybody in aviation several times, but we, at least, hadn't heard it before and so we are printing it on the chance that some others might have missed it also. A group of pilots were talking together at one of the recent air shows, at which show not quite as many planes had been sold as might have been expected. An old lady had been listening very interestedly to whatever conversation she could overhear and when the group broke up she touched one of the men on the sleeve. "Young man," she said, "It is very interesting to me to hear you aviators talk. Please tell me one thing I have wanted to ask someone who really knew. What is the greatest danger in aviation today?" The answer was, "Starvation, madam, starvation."

• • •

A news item from California tells of a local pilot who, after some years of flying around the local airport, started off on his first cross country. His telegram back to his friends at the field read, "Fine trip. Landed O.K. upside down. Send propeller."

The telegram might not be so funny as it sounds on first reading. Friends have reported cross country trips they have made when they would have been glad to make a landing even if upside down.

• • •

A news item in the London *Times* tells of an interesting incident in the night mail run across the Channel. The pilot left Brussels for Croydon late one night but after crossing the English coast found air conditions so bad that he decided to return. However, when he reached the town of Maidstone the weather had closed in all around him so he decided to stay over the lights of the town until things cleared up a bit. After circling the town at a height of three hundred feet for ninety minutes so many people became excited with the noise of the tri-motored ship that town officials called up Croydon to ask if the ship couldn't be flown away. Croydon officials responded by obtaining complete weather information for the pilot, sent to him by radio, but the weather stayed so bad that the pilot remained over the town until dawn. Meanwhile there were other calls from the Maidstone officials asking that the ship be removed so that the town could get some sleep, but the pilot stayed put, where the lights were bright and cheery.

Now if only London were an up-and-coming town like New York they would have sent up their aerial police to demand that the loiterer move on.

• • •

More fearful and wonderful aeronautical news from California: Mr. J. T. A. reports that there was so much flying over one airport out there that the air became all worn out and bumpy and the field had to be moved a short distance away—to winter greens as it were—to give it a chance to recover.

• • •

Here's an order which would be a vast relief to any airplane engine designer: "Not content with his triumphs in the fields of practical aviation and motorless flying, Col. Charles A. Lindbergh plans to take up the study of power gliding. It has been learned here that the flying Colonel has ordered a glider engine weighing 26,000 pounds and developing ten horsepower." Discovered in The Dallas Daily *Times Herald*, by R.J.D. of Dallas, Texas.

• • •

We have long been campaigning for truth in aeronautical advertising and news stories, but when we do run across a perfectly frank piece of work, it seems startling even to us. The following item from the Washington *Post*, thanks to Miss B.C., gives the real reason for a number of crack-ups but this is the first case on record where the pilot admitted it: "The first crack-up was that of Lieut. L.F.G——, who ground-looped at the Naval Air Station when the *mind* changed suddenly while he was coming in for a landing."

• • •

Sometimes we fear that the old saying that "the boys will fly anything if you pay them enough money" is very nearly true. Another note discovered in AVIATION by C. F. McR. states "A feature of the exhibit was the No. 3438 spiral expansion reamer with a specially designed aircraft pilot."

Timken Heavy-Duty Mill Type Quad Bearings 29½" Bore, 46½" outside diameter, 29" width. Capacity 7,000,000 pounds.

Timken Bearings *are* Licking *the* Toughest Jobs *in* Industry—Hence *their* Vital Necessity *in* Modern Aircraft

Sweeping on and up with an irresistible rush, Timken Bearings soar to greater and greater heights of achievement as they are pitted against the toughest jobs that Industry can produce . . . upsetting all preconceived ideas of production and production costs—revolutionizing anti-friction requirements . . . brushing aside old theories and traditions to make way for new standards of anti-friction efficiency, economy and endurance.

Terrific pressure loads such as are met in steel rolling mill service—as high as 7,000,000 pounds, are being carried by Timken Bearings in many of the country's largest steel plants.

Hair-breadth accuracy such as is demanded by the finest precision machine tool work is maintained as a matter of regular daily routine.

And thrust and speed and weight and shock—no matter how severe, are handled with equal capability and sureness whether encountered in such widely different types of heavy duty service as automobile operation, paper mills, transcontinental limited trains, oil field equipment or any other kind of machinery.

Wherever wheels and shafts turn, "Timken Bearing Equipped" is the modern symbol of protection and saving.

You need and should demand Timken benefits in engine rocker arms and in landing and tail wheels. The Timken Roller Bearing Co., Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

SEND FOR YOUR COPY

APRIL 19, 1930, there were 39 Approved Flying Schools in operation . . . 19 of the most modern were using FLEETS > > > Of the first 5 schools approved . . . 4 were using FLEETS at the time of approval (July 15, 1929) > > > Of 21 schools approved during 1929 . . . (excluding Curtiss-Wright schools), 17 were using FLEETS . . . the standard training plane of the Western Hemisphere. If you would know more about The FLEET, write for your copy of the booklet, "How To Judge An Airplane".

FLEET AIRCRAFT, INC.
BUFFALO . . . NEW YORK

THE FLEET NOW $3,985

FLYAWAY, BUFFALO, N. Y.

ROCKER-ARM LUBRICATION is no longer a problem

The aviation industry has found the one effective lubricant for this difficult task. Texaco Marfak Grease is especially recommended for enclosed rocker-arm and valve assemblies and for practically all grease-lubricated bearings. It has demonstrated by performance—in the engines of many noted aviators, and in the laboratories of the country's foremost engine manufacturers — that it is an exceptional lubricant. The lasting qualities of Texaco Marfak Grease, its lubricating efficiency and sturdy resistance to the influence of continued high temperatures are remarkable. Try it. Texaco Marfak Grease and the well known Texaco Airplane Oils and Texaco Aviation Gasoline are available at the principal airports of the country. Write The Texas Company on any question of aircraft lubrication.

THE TEXAS COMPANY, 135 East 42nd Street, New York City

TEXACO AIRPLANE OIL
TEXACO MARFAK GREASE
TEXACO AVIATION GASOLINE

FOUR AND A QUARTER *MILLION* MILES OF SAFE FLYING!

That's the record established by
WESTERN AIR EXPRESS *with*

PENNZOIL

"THE BEST MOTOR OIL IN THE WORLD"

NEW W.A.E. TERMINAL, ALHAMBRA, CAL.

WESTERN AIR EXPRESS

617 W NINTH STREET
TRINITY 9191
LOS ANGELES

April 17, 1930

Pennzoil Company,
136 West Washington,
Los Angeles, California.

Gentlemen:

Four years ago today the Western Air Express commenced operations between Los Angeles and Salt Lake City carrying air mail. This was one of the first air mail routes operating under contract with the Post Office Department.

Four years ago we were flying 1200 miles daily. This has been increased until today we are flying over 3,358,000 miles yearly and have the most diversified operation of any air transportation company in the world, operating over both land and sea, from sea level to the highest air line in the world, and with planes in the air throughout every hour of the day and night.

We are pleased to state that during these four years we have used Pennzoil exclusively on all our operations and it has given us splendid lubrication for more than the four and a quarter million miles we have flown without injury to any passenger.

Very truly yours,
WESTERN AIR EXPRESS,
James G. Wooley
Vice President.

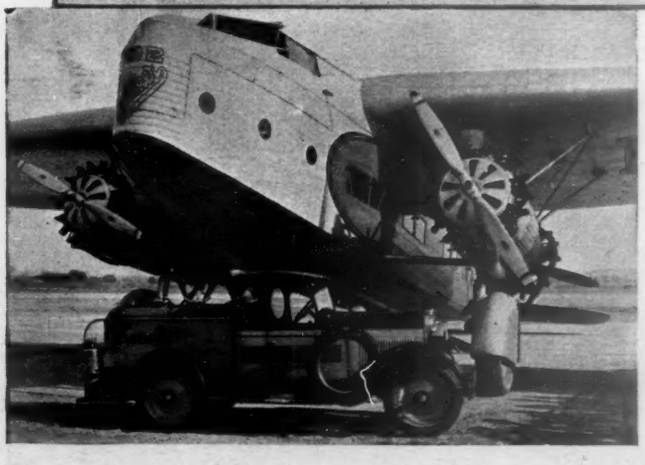
James G. Wooley/GMM

No motor oil could be given a more impressive endorsement than the letter reproduced on this page, which testifies to Pennzoil's four-year record with one of the great passenger lines of America —Western Air Express. Yet one trial of Pennzoil will tell you more than any testimonial ever written. You'll see the difference Pennzoil makes in actual motor performance: Extra power, extra smoothness, extra safety under every operating condition. Extra miles, too—for Pennzoil is the most economical oil you can buy. Ask any operator who uses it!

GUARANTEED BY THE PENNZOIL COMPANY — 100% Pure Pennsylvania Oil of Supreme Quality — PENNZOIL

PERMIT NO. 2—PENNSYLVANIA GRADE CRUDE OIL ASS'N

THE PENNZOIL COMPANY
Executive Offices and Refinery: **Oil City, Pa.;** ***Division Offices:*** **New York, Chicago, Los Angeles**

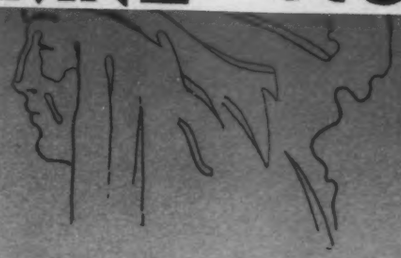


One of the new Fokker planes, the largest land planes in the country, recently put into operation by Western Air Express. They are powered with four gigantic motors and have "Pullman" accommodations for 32 passengers. The size of the plane in the photograph can be judged by comparing it with the Pennzoil truck underneath the cabin.

PENNZOIL

HIGHEST QUALITY PENNSYLVANIA OIL

FOR AEROPLANE MOTORS



Greater Accuracy and Speed on Aeroplane Valve Work

PRECISION work in refacing valve seats in aeroplane motors is made easy with the Sioux method. This Sioux reaming outfit includes a special Sioux Pilot Stem, Feed Screw, Feed Screw Body, and T Socket Handle. When the Feed is screwed up it brings the reamer against the valve seat. A simple, positive arrangement keeps the reamer teeth beneath the surface of the metal, preventing the reamer from sliding over the glazed surface.

Sioux Aeroplane Reamers are made of a special alloy tool steel which stands up and holds its cutting edge in the severe work of cutting the bronze valve seats used on most aeroplane motors. They are also made left handed so the tool can be turned to the right. Cutting resistance has been reduced by eliminating some of the cutting edges. Made in 45° finishing and roughing, 15° narrowing in finishing type and 75° narrowing in finishing type.

Your Jobber Sells Them

ALBERTSON & CO., INC., Sioux City, Iowa, U. S. A.

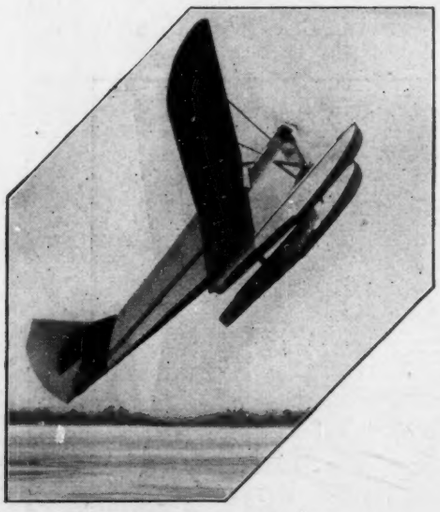
No. 1650 Sioux Aeroplane Reamer Set. Net, Complete . . . **$64.25**

SIOUX
Trade Mark Reg U.S. Patent Office

STANDARD THE WORLD OVER

VALVE SEAT REAMERS

PONTOONS....



on the Giant 1275 H.P. Ford Trimotor or the 30 H.P. Aeronca . . . . Superior Performance Reflects Better Engineering

The relative performance of your ship on Pontoons is dependent entirely upon the engineering ability of the Pontoon Designers.

Our engineering staff is composed of carefully selected specialists whose experience and past achievements place them among the leading authorities in their respective fields.

Aircraft manufacturers can safely turn their Pontoon problems over to Aircraft Products Corporation, and rest assured that these specialists will produce Pontoons particularly adapted to their individual type of ship . . . Pontoons that will provide maximum performance in getting off the water, and minimum head resistance in flight. You are invited to discuss your Pontoon problems with our engineering staff.

In actual tests the Ford Trimotor, 5 A. T. equipped with Pontoons designed and built by the Aircraft Products Corporation, and fully loaded to 13,500 lbs., left the water in fifteen seconds. And, due to the careful streamlining of these Pontoons, its air speed was retarded only five miles per hour. The little Aeronca gets off the water in ten seconds and its top speed is retarded only three miles per hour.

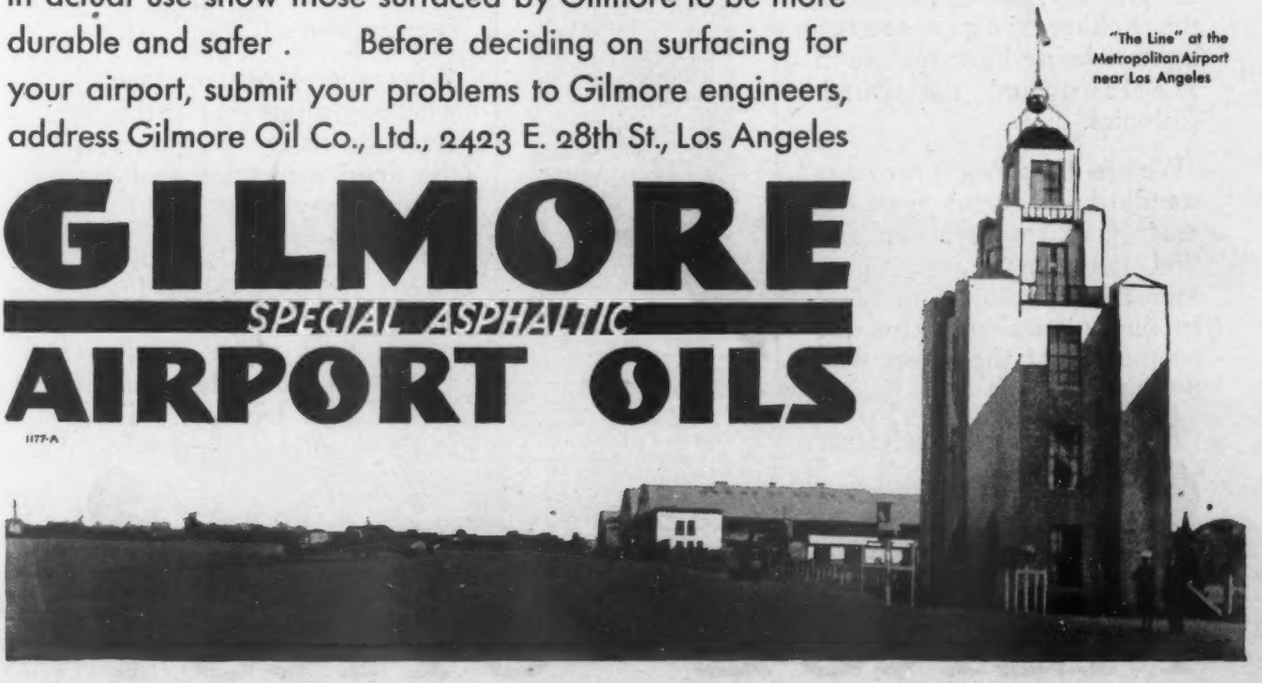
AIRCRAFT PRODUCTS CORPORATION OF AMERICA
DETROIT, MICHIGAN

Aircraft Products
CORPORATION
OF AMERICA

ANOTHER AIRPORT GOES GILMORE

Metropolitan Airport, Los Angeles... Combined landing and take-off runways . . . Gilmore surfaced. (Note uneven terrain of turf covered areas)

After an exhaustive test of various surfacing materials and surfacing methods, the Metropolitan Airport selected Gilmore . A comparison of construction costs show that Gilmore surfacing costs less . A survey of surfaced fields in actual use show those surfaced by Gilmore to be more durable and safer . Before deciding on surfacing for your airport, submit your problems to Gilmore engineers, address Gilmore Oil Co., Ltd., 2423 E. 28th St., Los Angeles



"The Line" at the Metropolitan Airport near Los Angeles

GILMORE

SPECIAL ASPHALTIC

AIRPORT OILS

1177-A

There are more Aerol Struts in use today than any other make.

AEROL STRUTS IN HOLLAND.

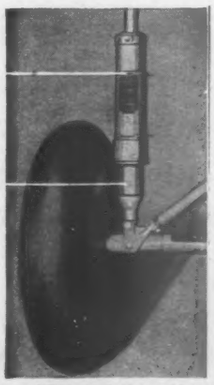
A SHORT time ago, the following message was received from H. Pander & Zonen of Holland. It is typical of the international recognition accorded Aerol Struts.

"The demonstration on Aerol Struts we gave for the Dutch Government made a big impression and as a result, the Army adopted these struts for use on the Fokker single-seater fighters being built for use in Holland and the Dutch Colonies.

"We are using Aerol Struts as standard equipment on all aircraft of our manufacture and find that they have greatly increased public confidence in our planes and also the confidence of the pilots who fly them.

"The Aerol Tail Wheel Strut gives complete satisfaction. Taxiing is like riding in a motor car and there is no jumping up of the tail after a bad landing.

"The Dutch Aero Club and Dutch National Flying School use Aerol Struts exclusively and are absolutely sold on their value. They feel it to be a fact that many crashes made by pupils previous to their use of Aerol Struts would have been prevented."



This view shows how Aerol Struts are installed between the fuselage and wheels. "A" is the stationary cylinder. "B" is the sliding piston attached to the axle allowing perfect freedom of movement, yet effectively eliminating destructive shock before it reaches the fuselage.

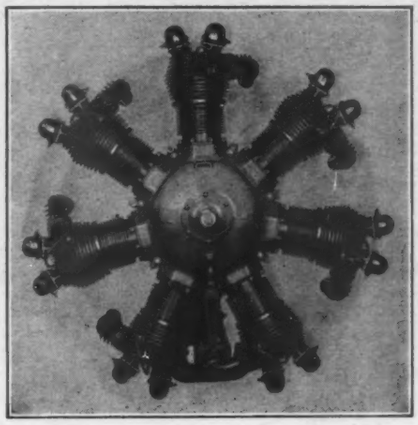
Wherever ships are flown—wherever pilots get together—Aerol Struts are recognized as the finest protection that can be given any plane.

Aerol Struts are manufactured by The Cleveland Pneumatic Tool Company, Cleveland, Ohio. The company also offers a complete line of air-operated hammers, drills and accessories.

AEROL shock absorbing STRUT

....TO MAKE GOOD SHIPS STILL BETTER

SWALLOW PLANES POWERED *Exclusively by* AXELSON



No snap judgment in this decision to power Swallow planes with AXELSON ENGINES exclusively!

On the contrary, it was the inevitable result of merciless tests extending over many months to determine just how fit these engines were.

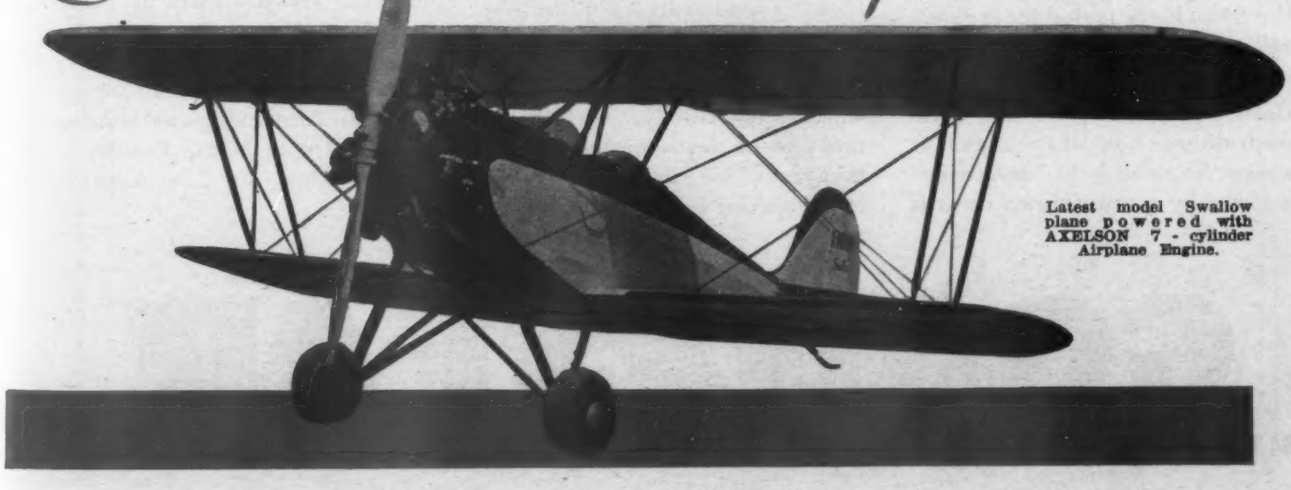
Would AXELSON ENGINES measure up to the high standards set by Swallow? Would they provide the dependability, the speed, the economy, the all-around superior performance demanded by Swallow engineers for the plane as a whole?

AXELSON ENGINES met all these tests—and now are used in the Swallow 3-place Training Bi-plane and the Swallow 2-place Sport Bi-plane, exclusively.

A coordination of engineering excellence that will blaze a new trail in aviation's progress!

Axelson Aircraft Engine Co.
Factory and General Offices,
Corner Randolph St. and Boyle Ave.
Los Angeles, California
(P. O. Box 337)

Swallow Axelson-powered



Latest model Swallow plane powered with AXELSON 7-cylinder Airplane Engine.

"The small training plane will undoubtedly make use of low-pressure tires, using them without shock absorbing members"

"The use of Airwheels without shock absorbers will come more and more into prominence"

"Oleo landing gears . . . combined with Airwheels, should make bad landings almost in excusable"

"The Airwheel type of tire . . . may result in checking the necessity of larger travel of the usual shock absorbing devices"

"The Airwheel will have great effect on landing gear design"

"Airwheels with modified shock absorbers will be conducive to softer landings and tend to reduce stress in the structure"

Airplane designers and engineers recognize

AIRWHEELS

as a definite part of future design

The quotations shown here are from one magazine, AVIATION. They came from a section in which officials of airplane companies expressed their opinions of future trends.

Have you investigated these great, soft, rolling rubber pillows for your planes?

Have you seen, by landing demonstrations, how they make it almost impossible to "nose over" a plane by coming down on soft ground — how they roll lightly over the top of plowed fields, marsh land and sand — how they prevent wing dragging, even in an intentional ground loop — how they take off and land so gently that you can hardly tell when they leave or come back to the ground?

Only Goodyear can give you Airwheel safety. Goodyear originated this type of tire — and an important part of Airwheel performance is the special Goodyear hub, with patented internal, self-centering brakes.

Before you undertake to re-design your ships for any type of low pressure tire equipment — find out what Airwheels can do. Nothing else can give you the same tested safety. For information or engineering assistance in equipping your future ships, write Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

GOODYEAR

EVERYTHING IN RUBBER FOR THE AIRPLANE

International News Service

KEEPING PACE WITH THE NAVY

THE annual Curtiss Marine Trophy Race, Navy speed classic, was won this year by Captain Arthur H. Page, U.S. M.C. Flying a Curtiss F6C-3 Hawk (1926), powered with a Curtiss D-12 engine, he established a new speed record for the event of 164.1 M.P.H. This is the fourth successive year that the race, which is open only to standard Navy Service types, has been won by a Curtiss single-seat fighter (three of the four with D-12 engines).

Now, in the two-seater class, Curtiss presents the new F8C-4 "Helldiver." Fast, maneuverable, and rugged, it combines the new functions of a diving bomber with those of a two-seater carrier fighter, keeping pace with the rapid development of Navy fighting tactics. It is being built in quantities for the Navy and the Marine Corps.

CURTISS AEROPLANE & MOTOR CO., Inc.

Offices: Garden City, N. Y. · Factories: Garden City and Buffalo, N. Y.

A DIVISION OF CURTISS-WRIGHT CORPORATION

MANUFACTURER OF PROGRESSIVE AIRCRAFT FINISHES

6 NEW COLORS IN BERRYLOID AIRCRAFT DOPE

LOW cost, long life and rich beauty feature the six new Berryloid Dope Colors just announced. Consolidated and Austin Blue, Robin Orange, Robin Yellow, Olive Drab No. 22 and U. S. Army Yellow No. 4 are now added to an already wide range of popular standard colors. Approved by the U.S. Air Corps and the Bureau of Aeronautics, first choice of most aircraft manufacturers — Berryloid has won recognition everywhere as the best pigmented dope on the market. It is light, can be brushed or sprayed on fabric or metal, won't crack or ringworm on either type of surface under severe pressure and costs approximately one-half as much as other types of finish. Berryloid Pigmented Dope offers utmost resistance to weathering, can be refinished successfully and is non-toxic — won't harm workmen. Complete stocks are carried at all important aircraft centers. Get the facts about this remarkable dope. Write for combination color card and new finishing specifications.

BERRY BROTHERS
Varnishes Enamels Lacquers
Detroit, Michigan *Walkerville, Ont.*

MEMBER AERONAUTICAL CHAMBER OF COMMERCE

The one unit
the entire
industry
OK's
as standard
equipment
KELSEY
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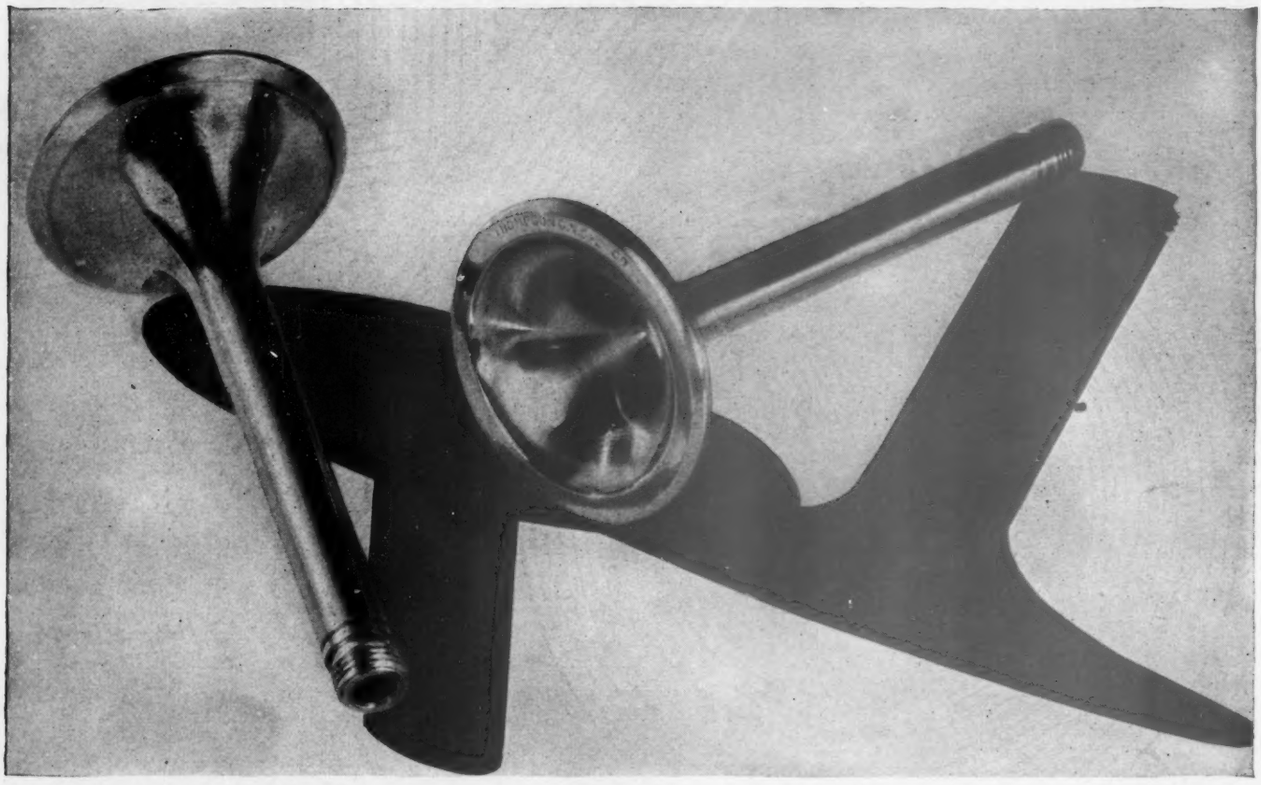
AIRPLANE WHEELS

EXHAUST VALVES that will not warp



Exhaust valves on "Wasp" and "Hornet" engines hold their shape. It is unnecessary to fill them with a liquid heat conductor for protection—a practice frequently employed in aircraft engines.

This means that Pratt & Whitney design must be unique in its provision for heat dissipation. It is. Additional radiating surface is provided by the valve gear housings themselves. They are cast as extensions on the cylinder head. Cooling fins are embodied into the exhaust housing. This construction is more expensive, but it results in better valve action and makes valve-grinding normally unnecessary before 300 hours of operation.

This is one of many factors which have earned acceptance for "Wasp" and "Hornet" engines on approximately 90% of the important regularly scheduled air transport lines.

THE
PRATT & WHITNEY AIRCRAFT CO.
EAST HARTFORD · · · CONNECTICUT
Division of United Aircraft & Transport Corporation

Wasp & Hornet *Engines*

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokyo.

SPEED. . .

with a new sense of security

SPEED has frequently been bought at too great a cost, not so much in dollars and cents, as in the sacrifice of other vital characteristics. To gain greater speed in designing an airplane it is easy to lose efficiency—and safety.

The greatest merit of Bellanca design is that the efficiency of the airplane and the safety of its passengers *have never been sacrificed for speed.*

Yet the Bellanca *Pacemaker* has been victorious in practically every speed race in which it has been entered. It will carry you (with a pilot and four guests) at 145 miles an hour—reliably, steadily, safely! With the throttle open only two-thirds, this sturdy cabin plane speeds along with great reserve power, flying stability and economy, at 122 miles an hour. With a somewhat larger engine, the Bellanca *Skyrocket* (same type of plane) travels at 150 miles an hour.

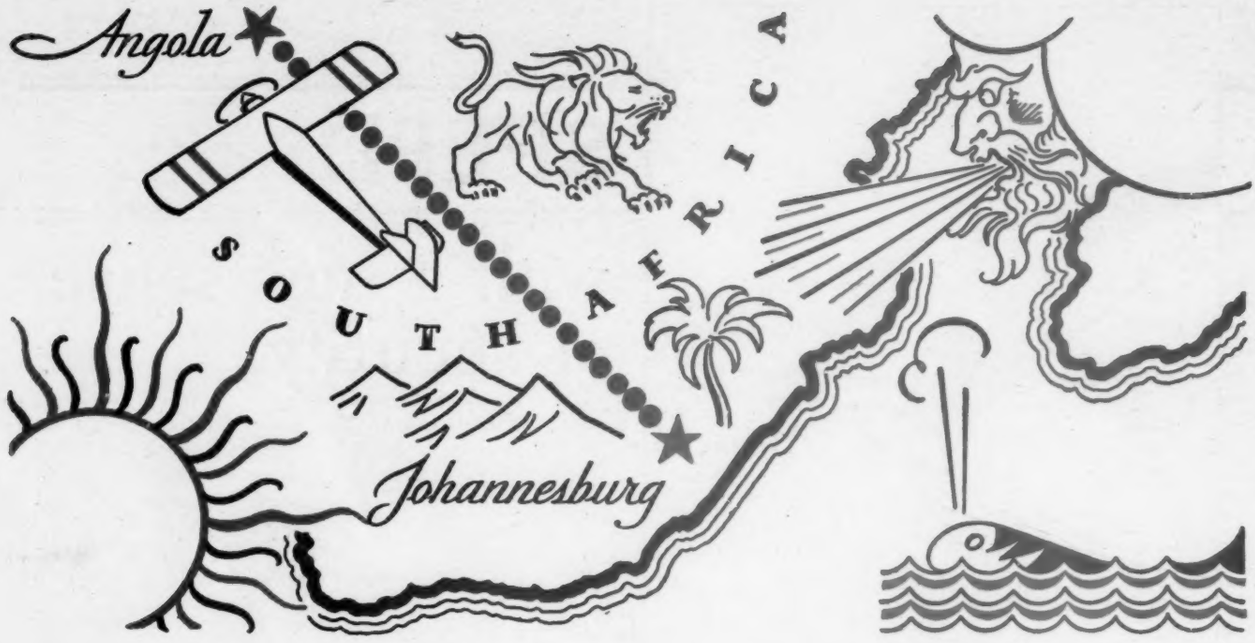
Superior speed, combined with a high rate of proved efficiency and safety, is the formula of Bellanca design and construction. "Built as only Bellanca can build" means that the finest materials obtainable have been manufactured under the personal guidance of leading engineers to produce an airplane of famous quality. People whose experience has taught them that only in excellent engineering can they hope to find excellent airplane building, buy the Bellanca with every sense of genuine security.

The Bellanca Pacemaker is a six-place cabin monoplane with 300 h.p. engine, finished in finest automobile coachwork. High speed, 145 m.p.h. Payload with pilot, 1,235 lbs. U. S. Dept. of Commerce Approved Type Certificate No. 129. **The Bellanca Skyrocket,** of similar specification, is powered with the 420 h.p. Wasp engine. High speed, 150 m.p.h. U. S. Dept. of Commerce Approved Type Certificate No. 319. Both types are readily convertible into excellent seaplanes. **The Bellanca Airbus** is a 12 to 14 place single-engined monoplane, particulars of which will be sent on request to any commercial operator.

BELLANCA AIRCRAFT CORPORATION
NEW CASTLE, DELAWARE

Canadian Distributors:
Bellanca Aircraft of Canada, Ltd., Montreal

BELLANCA



6000 miles to save a life

Mobiloil-lubricated plane carries serum across South Africa

Lieutenant J. Rodwell King is the hero of one of the most thrilling flights in the history of aviation. Leaving Johannesburg, South Africa, with anti-hydrophobia serum for a sick woman missionary in Angola, Lieutenant King made a 6000-mile round trip to deliver it.

Difficulties beset him on every hand—tornadoes, intense heat, a faulty compass, treacherous, cloud-capped mountain ranges. That Lieutenant King finally won out is an excellent tribute to his courage, to the splendid performance of his sturdy Gypsy Moth and to the lubricating efficiency of Mobiloil Aero Oils — used throughout the trip.

A news story in the *Cape Times* (Cape Town, South Africa) says of Lieutenant King's own enthusiasm:

"King has great praise for the Vacuum Oil Company's service throughout the trip and the magnificent behavior of his Gypsy Moth, which did not so much as misfire on the whole tremendous journey."

Again, Mobiloil Aero Oils have played an important part in one of the great flights of aviation. The same double-range Mobiloil Aero Oils used by Lieutenant King in his amazing trip are on sale at established airports throughout the world.

VACUUM OIL COMPANY

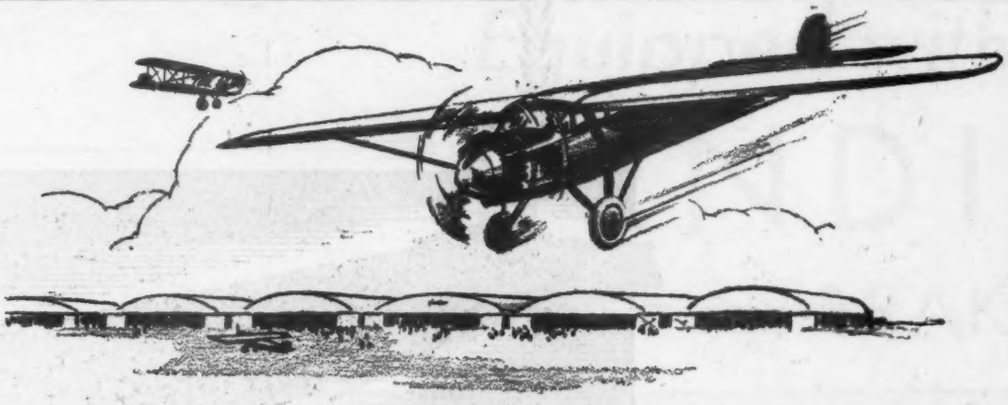
Makers of high-quality lubricants for all types of machinery

GARGOYLE

Mobiloil

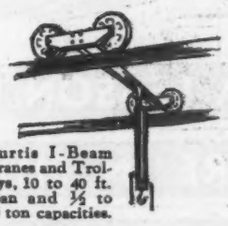
AERO OILS

FOR ROCKER-ARM LUBRICATION USE MOBILGREASE

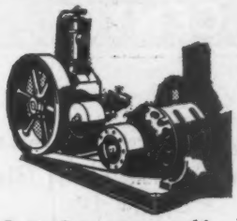


Speeding up airplane production and servicing

with Curtis compressed air equipment

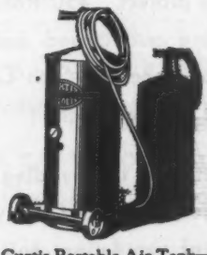


Curtis I-Beam Cranes and Trolleys, 10 to 40 ft. span and ½ to 10 ton capacities.



Curtis Compressors are ¼ to 50 H. P. with capacities up to 250 cu. ft. per minute.

Curtis Air Hoists, capacities from ½ ton to 10 tons.



Curtis Portable Air Tank—For taking air out to a plane away from the usual source of supply.

Write for new Catalog C-76

FULLY as important as the speed of planes is the speeding up of the building maintenance and servicing of planes. Executives throughout the aviation industry are rapidly coming to realize that compressed air is one of the most important factors in putting speed into this work.

Obviously, time, labor and money are saved in very appreciable amounts by compressed air equipment such as—

CURTIS TIMKEN EQUIPPED COMPRESSORS—providing air for spray painting, spraying dope on the wings, tire inflation, charging shock absorbers, spray cleaning engines, spraying of grease solvent or paint removers, air-drying of parts dipped in cleaning solutions, blowing out dust, chips, etc., at work benches and drilling presses; air power for operating air hoists, riveters, pneumatic drills, sand blasts, pneumatic water systems, etc.

CURTIS AIR HOISTS—Power hoists at little more than the cost of chain blocks. Used with a Curtis I-Beam Trolley or Crane, they can serve a wide floor area. Used for lifting engines out of fuselages, mounting engines, and other parts, and many other purposes where a combination of power, speed and accuracy is a factor of economy. Because there are no delicate mechanisms, even unskilled laborers can operate Curtis Hoists without danger of throwing them out of commission.

CURTIS AIR TANKS—Portable tanks for taking air out to a plane away from the usual source of supply. Stationary tanks for use with compressor unit in the shop, also separate tanks for mounting on service trucks.

CURTIS

St. Louis

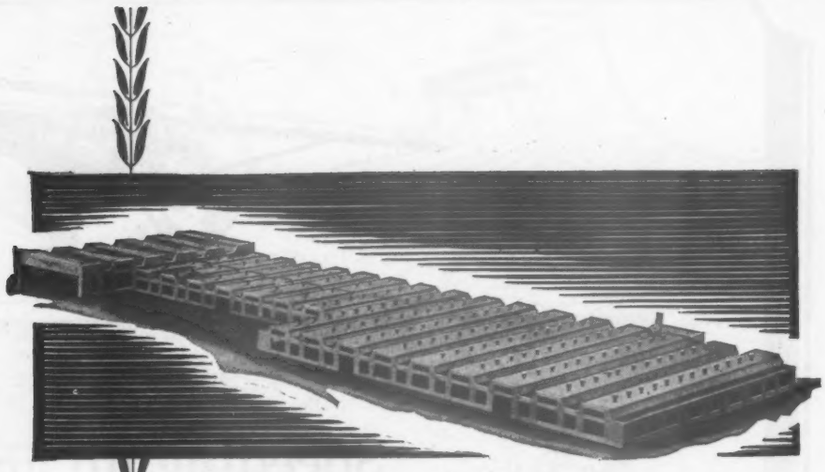
The Curtis Pneumatic Machinery Co., was founded in 1854 and is, therefore, in its 76th year. Three-quarters of a century successful business existence can be explained only by integrity, sound policy and financial strength to permit the extensive development and research work necessary to keep our products in advance of competition.

1954 Kienlen Ave., St. Louis

5518 AF Hudson Term., N. Y.

Write for Catalog C-76 and state the product, etc.

A2



THERE IS A LESSON FOR THE FUTURE IN THIS AVIATION CENTER

Here, concentrated in one spot, every branch of aeronautics will be provided for in the new airport and plant of the Glenn L. Martin Company, near Baltimore.

Laboratories for the engineer . . . shops for the artisan . . . a school for the student of airplane design . . . another school for the student of flying . . . a residence colony with hydroplane landing for the amateur flier . . . a hotel, restaurant and camp for visitors . . . every side of flying. The world may see many of these in the future.

The H. H. Robertson Company has been privileged to cooperate in the development of this pioneering project. 450 Robertson Ventilators provide stormproof ventilating outlets and assist in perfect circulation of air. Great stretches of Robertson Sash Construction in the roof provide strong but diffused overhead light.

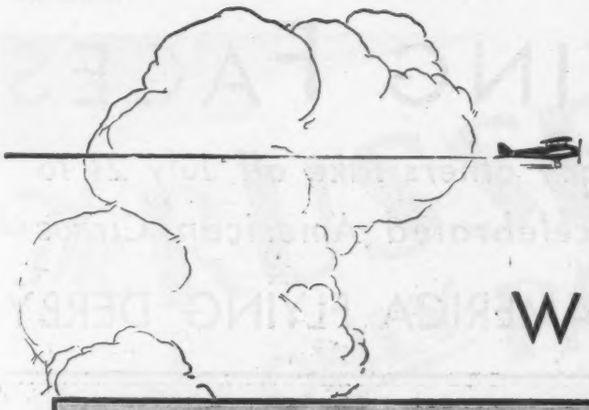
ROBERTSON *shares its* HANGAR BUILDING *experience*

The Robertson Company is cooperating in the building operations in most of the fields where great projects are afoot. If you have any building problems, any problems of ventilation, any problems of daylighting, write to the Robertson engineers for their suggestions.

H. H. ROBERTSON COMPANY ·· PITTSBURGH, PA.

ROBERTSON
WORLD RPN WIDE
BUILDING SERVICE

Copyright 1930—H. H. Robertson Co.



Equipped with

BENDIX

WHEELS AND BRAKES

The NEW SPARTAN C3-225

This new, heavier, faster, more powerful Spartan has exceptionally rugged undercarriage and 30 x 5 Bendix Wheels and Brakes—big factors of safety in landing and ground maneuvers.

Consult our Engineering Department without obligation.

BENDIX BRAKE COMPANY
SOUTH BEND, INDIANA
(Division of Bendix Aviation Corporation)

BENDIX 4 BRAKES

FOR SAFETY

Fully protected by patents and applications in U. S. and abroad

FAMOUS FLYING FACES

Referees:
CAPT. FRANK M. HAWKS
MAJOR LUKE CHRISTOPHER

. . . these and many others take off July 21 to compete in the celebrated American Cirrus

$25,000 ALL-AMERICA FLYING DERBY

Contact! A roar down the runway . . . the graceful sweep of a gull as it takes the air . . . rises . . . thunders on . . . till it's but a speck in the distance. It's 6 a.m. in Detroit, July 21 . . . Lee Gehlbach in the Commandaire Little Rocket is off for Buffalo! Another roar . . . another sweep . . . another speck . . . another. . . and another. The All-America Flying Derby is under way . . . crack pilots seek fame and fortune in the skies . . . on they go . . . Buffalo . . . New York . . . Atlanta . . . Little Rock . . . Houston (The entire Mexico leg has been eliminated since first announcements). Midland . . . Douglas . . . Los Angeles . . . Oakland . . . Ogden . . . Omaha . . . Chicago. One plane will come to rest again at Detroit before the others . . . One man will win undying fame . . . All will share the laurels of true achievement . . . many may profit from the ample prizes . . . all will give to the future of flying the greatest impetus of contemporary times.

LT. H. H. OGDEN

TEX RANKIN

CHAS. W. MEYERS

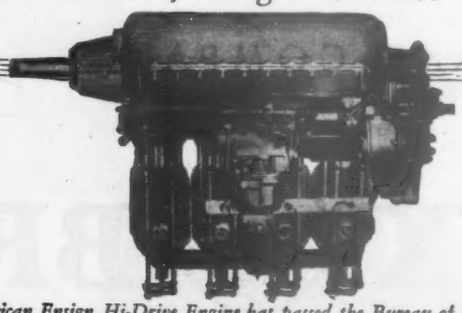
¶The original $25,000 offered by American Cirrus Engines, Inc. has already grown to $33,800 with the addition of special and lap prizes. Detroit, Atlanta, Houston, Douglas and Los Angeles to date have offered cash prizes to winners of respective laps, and other cities are yet to be heard from.

VERNE L. ROBERTS

¶Follow the All-America Flying Derby. Support it with your interest, for it is a racking test of airmanship and plane and motor construction . . . a magnificent contribution to the development of the business of flying, whose primary purpose is to promote aviation by increasing public interest in flying as a means of transportation and by demonstrating the power, reliability and safety of moderately priced aircraft.

JOHN LIVINGSTON

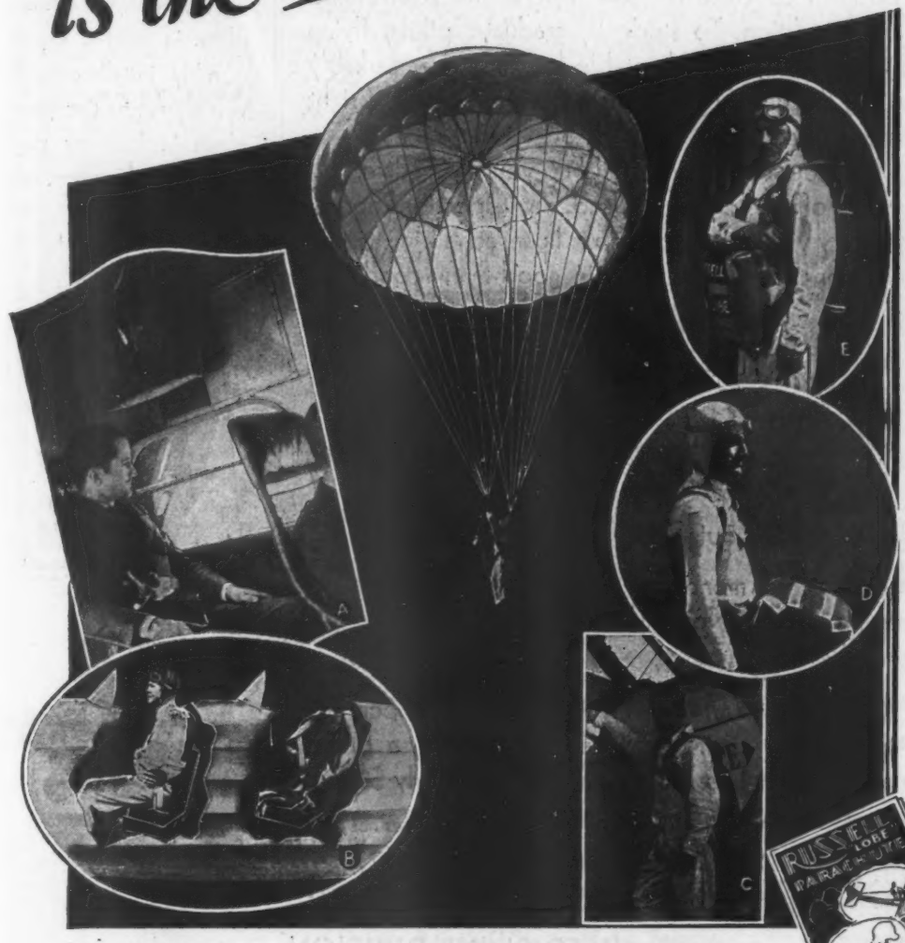
PRIZES
to date total
$33,800
including lap prizes offered by several cities.



American Ensign Hi-Drive Engine has passed the Bureau of Standards test for approved type certificate with a rating of 95 h. p. at 2100 r. p. m. This engine equipped with a DePalma Supercharger delivers over 110 h. p.

American Cirrus Engines, Inc., Marysville, Mich.

The RUSSELL "LOBE" is the ONLY PARACHUTE that



1 *Opens quickly & positively--without depending on springs, rubber bands, pilot chutes or other mechanical devices that may deteriorate or get out of order.....*

2 *Functions quickly without excessive opening shock load.....*

3 *Lets you down comfortably, at a slow rate of descent.....*

4 *Does not oscillate or sway during descent.....*

5 *Enables you to land gently---and squarely on your feet.*

THESE outstanding features are the direct result of proven patents covering the "Lobe" type of parachute and pack--controlled and developed exclusively by the Russell Parachute Company. Remember, there is only one "Lobe" type parachute.

That every detail of the design and construction in Russell Parachutes is time-tested and thoroughly tried is evidenced by the fact that--*The Russell "Lobe" Parachute has never failed to open in an emergency and bring its load safely to the earth.*

Naturally this modern aerial life-saver, made to meet modern aeronautical conditions, is a great favorite with transport companies, school officials and experienced flyers the world over.

»»»» There are more than 25 MEMBERS of THE RUSSELL CATERPILLER CLUB «««« who owe their lives to the unfailing efficiency of Russell "Lobe" Parachutes. «««««««

Send for Descriptive Folder

THERE'S A CONVENIENT RUSSELL PARACHUTE PACK for every type of plane

In recent months Russell engineers have perfected a number of innovations for the convenience, comfort and safety of flyers. Notable among these is (A) The "quick-attachable" parachute pack and safety vest for use in cabin planes. With this equipment the passenger merely dons a loose-fitting, comfortable vest to which the parachute pack is quickly attached in case of emergency. (B) The new Russell seat pack with detachable back pad is also an interesting development. With this equipment you may always leave the parachute in the cockpit, fastening and unfastening the parachute harness while seated, just as you do with the safety belt. Other Russell packs are (C) the back pack, (D) the lap pack and (E) the training outfit consisting of two parachutes.

All Russell Parachutes are available in either silk, pongee silk or cotton materials. Prices range from $250 up. Send for descriptive folder and location of nearest Service Station.

RUSSELL PARACHUTE COMPANY

1202 Kettner Boulevard — San Diego, California

Eastern Sales Office, 122 E. 42nd Street, New York

Service Station Managers Wanted

Russell Parachute Service Stations are being established throughout the United States. Experienced parachute service men are wanted. Write for our attractive proposition.

REMARKABLE BARGAINS IN GOOD USED PLANES

Certified by

CURTISS-WRIGHT FLYING SERVICE

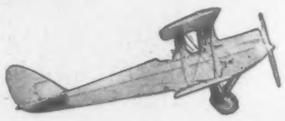
AT ITS many bases the Curtiss-Wright Flying Service is constantly adding new equipment, and is in a position to offer for sale operations planes and demonstrators in practically new condition. To students, graduate pilots, flying clubs and other groups who are looking for unbeatable bargains at remarkably low prices, these planes offered by the Used Plane Division of the Curtiss-Wright Flying Service demand your immediate action.

This is the time of the year to buy your own plane, build up your flying time, and profit while you pay for it. Every plane offered carries a "Used Ship Inspection Report" specifying the exact condition of every vital part. Each ship is licensed, a big majority are sales demonstrators, and every one is airworthy and in good flying condition.

Curtiss-Wright Flying Service offers you a most unusual financing service that enables you to buy your plane on a deferred payment plan. Moderate finance charges and insurance coverage . . . down payment 33⅓%—balance due on plane in twelve equal monthly installments. If you expect to use your plane in business pay for it out of current income.

OUTSTANDING VALUES

ROBIN—3-place cabin monoplane, OX engine, D.C. No. NC63H, 59 hours, Cleveland Base. $1950



MOTH—Popular 2-place open biplane, powered by Wright Gipsy engine, D.C. No. X829H. Plane has had 70 hours, engine 20 hours. St. Louis Base. $3300

CESSNA—4-place monoplane, powered with Warner engine, D. C. No. NC8781, 85 hours, Valley Stream Base. $3625

COMMANDAIRE—(Trainer) 2-place open biplane, OX engine, D. C. No. NC478E, a brand new ship at Los Angeles Base. Only $1800

ROBIN—3-place cabin, OX engine, D. C. No. C262E, 90 hours, Chicago Base $1,800

◆

ROBIN—3-place Challenger engine, D. C. No. NC92H, 236 hours, Detroit Base $4,215

◆

CESSNA—4-place Warner engine, D. C. No. C9858, 174 hours, Memphis Base $3,180

◆

COMMANDAIRE—3-place open biplane, 165 Whirlwind engine, D. C. No. NC977E, 49 hours, Kansas City Base $4,775

◆

WACO—3-place open biplane, Siemens-Halske engine, D. C. No. NC9513, 254 hours, Rockland Maine Base $2,800

◆

MOTH—3-place open biplane, Gipsy engine, D. C. No. NR857H, 140 hours, St. Louis Base $3,700

Specially fitted with 30-gallon gas tank, special carburetor for upside down and stunt flying.

Write for complete list of Used Planes. Space does not permit entire listing of the marvelous values now obtainable at all Curtiss-Wright Flying Service Bases. Write for full details on these guaranteed Used Planes, prices and terms of payments, to the Curtiss-Wright Base nearest you, or direct to the main office.

USED PLANE DIVISION

CURTISS-WRIGHT FLYING SERVICE

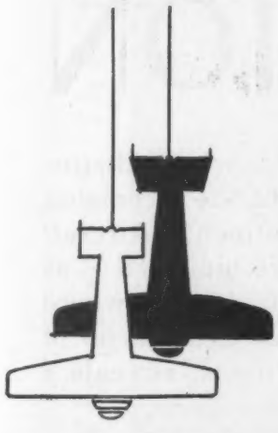
27 WEST FIFTY-SEVENTH STREET • NEW YORK

ATLANTA	Georgia
BALTIMORE	Maryland
BOSTON	Massachusetts
BRIDGEPORT	Connecticut
BUFFALO	New York
CALDWELL	New Jersey
CHICAGO	Illinois
CLEVELAND	Ohio
COLUMBIA	South Carolina
COLUMBUS	Ohio
DALLAS	Texas
DENVER	Colorado
DETROIT	Michigan
HARTFORD	Connecticut
HOUSTON	Texas
INDIANAPOLIS	Indiana
KANSAS CITY	Kansas
LOS ANGELES	California
LOUISVILLE	Kentucky
MEMPHIS	Tennessee
MIAMI	Florida
MILWAUKEE	Wisconsin
MOLINE	Illinois
NEW YORK	New York
NORTH BEACH	Long Island
OKLAHOMA CITY	Oklahoma
PITTSBURGH	Pennsylvania
PORTLAND	Maine
RALEIGH	North Carolina
ROCKLAND	Maine
ST. LOUIS	Missouri
SAN FRANCISCO	California
TOLEDO	Ohio
VALLEY STREAM	New York

A lighter, stronger safety glass

The Mono Airplane Co. uses Armor-Lite exclusively. This selection was due to the fact that Armor-Lite "Featherweight" is a lighter, stronger glass particularly suited for aircrafts, and is easier to cut and install.

The Monocoach shown here recently completed a tour of the United States advertising the Elk's Convention at Los Angeles.



At every large airport, you will find the more modern planes equipped with Armor-Lite scatter-proof glass.

Armor-Lite is an improved safety glass that provides increased protection and visibility with decreased weight.

5 Ply Armor-Lite weighs five to ten ounces per square foot less than 3 ply sheet drawn or polished plate . . . Featherweight Armor-Lite weighs only twenty-four ounces to the square foot.

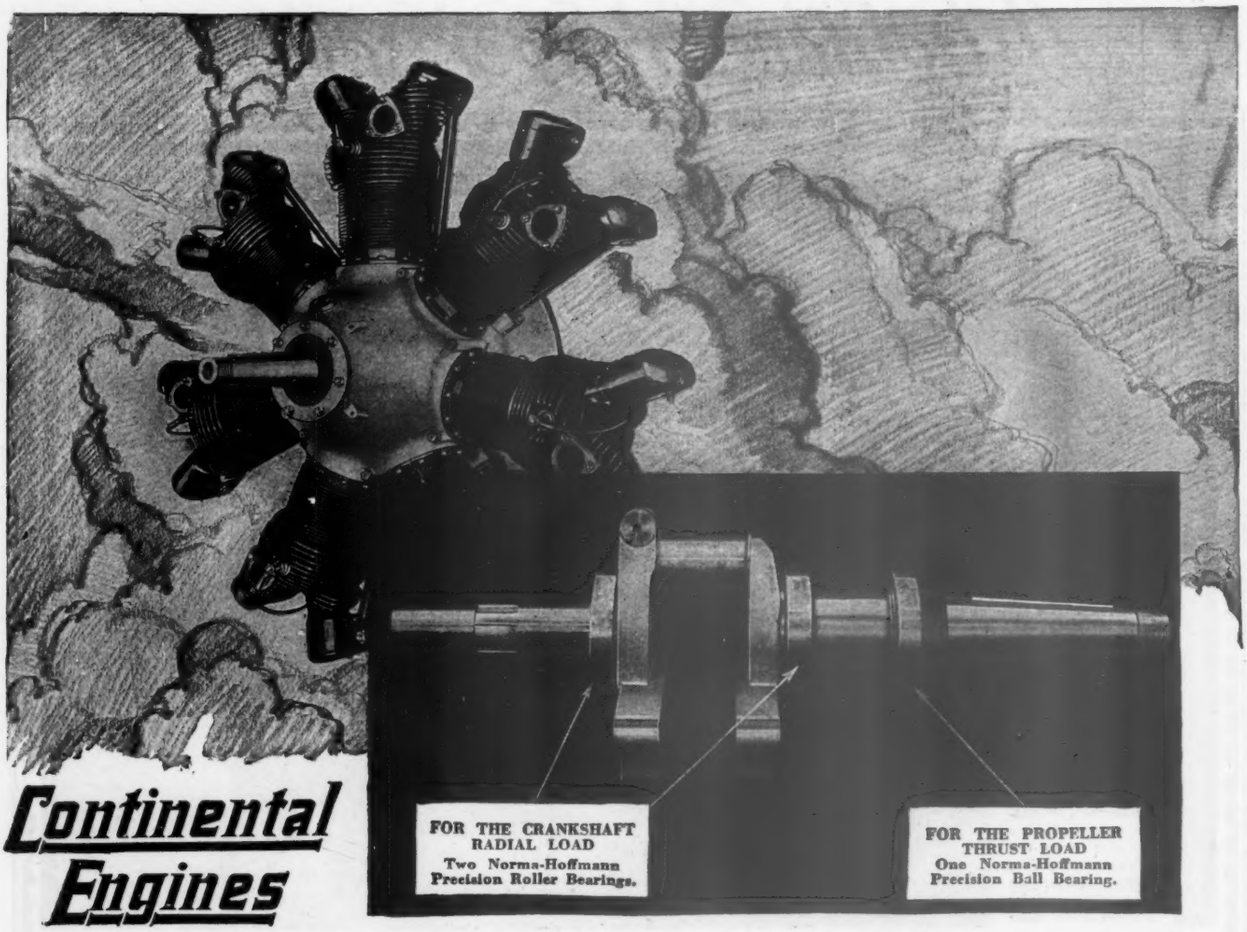
The installation of Armor-Lite increases the sales appeal of aircrafts and gives transport companies and flying schools an added advertising feature.

No safety glass made excels Armor-Lite in quality, visibility or strength. . . Write for our book let . . . Address

AMERICAN WINDOW GLASS CO.

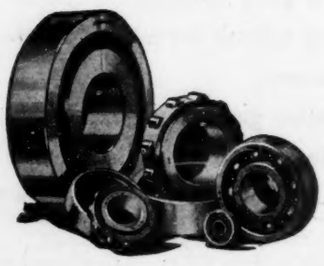
WORLD'S LARGEST PRODUCER OF WINDOW GLASS

PITTSBURGH, PENNA.



Continental Engines

capitalize the value of PRECISION



NORMA-HOFFMANN Precision Bearings, in a wide range of aircraft applications in which our engineers have assisted, are proving their super-capacity for hard service. Let us work with you on your problems.

THAT super-dependability which distinguishes NORMA-HOFFMANN Precision Bearings is incorporated in Continental Aircraft Engines at the vital points here indicated — as well as on the pump drive shaft. Here, "where the bearings must not fail," that extra factor of safety which PRECISION affords, reveals a value far above all price considerations.

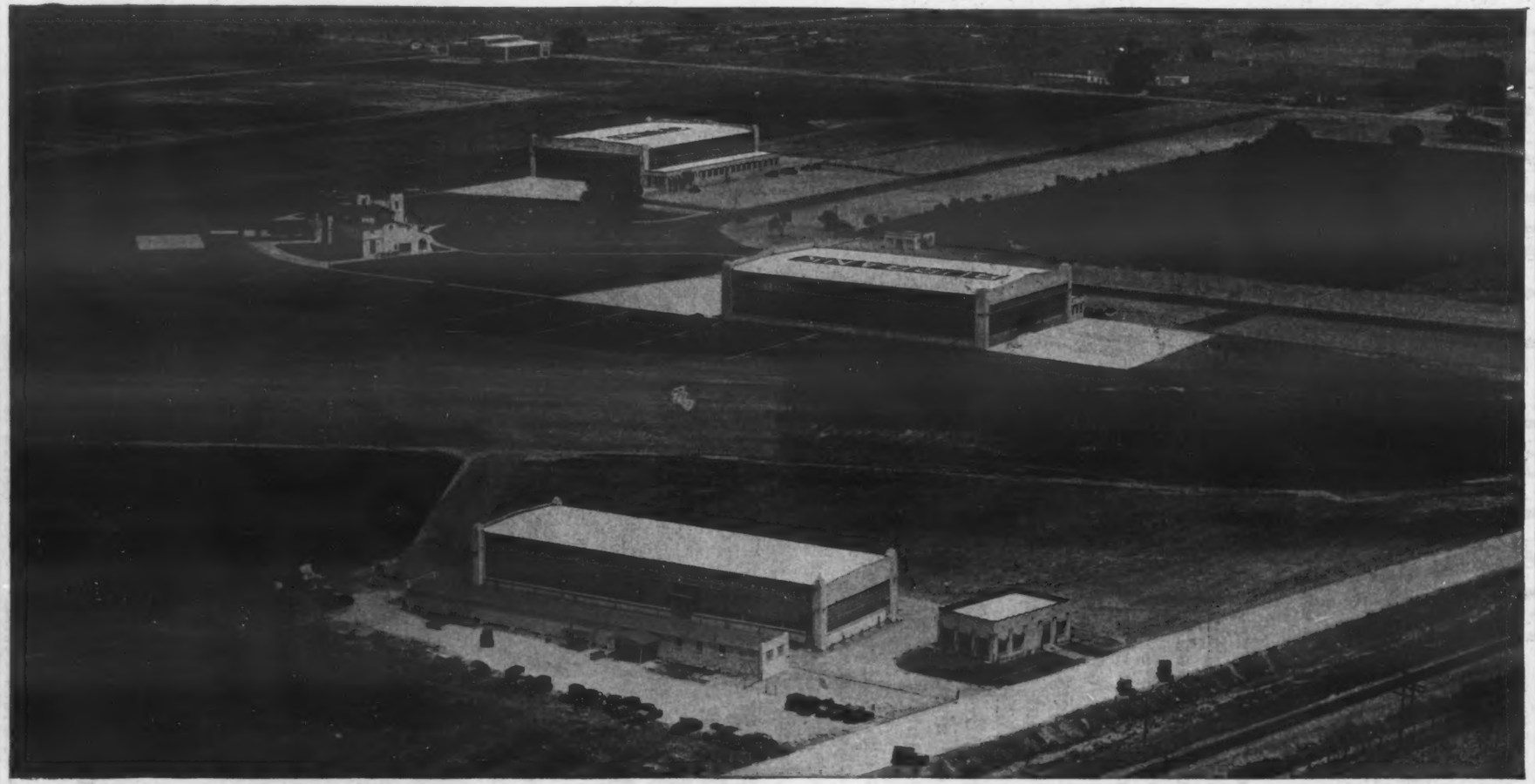
May our engineers be of service?

"NORMA-HOFFMANN"
PRECISION BEARINGS

28-1026

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.

United Airport of the Boeing System, Burbank, California



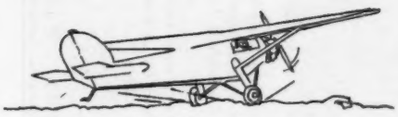
Airplane view of the United Airport—a complete air terminal offering every comfort and convenience for the traveling public—providing complete facilities for the operation and servicing of ships as well as for airplane and accessory manufacturing operations. The United Airport field, like a super-highway for motor transportation, is designed for the greatest of safety and efficiency with its numerous wide runways and convenient taxi areas.

A magnificent terminal building houses the executive offices of the port, offices of transport companies using the field, a complete passenger station, a control room as well as telegraph and radio offices. Two large steel and concrete hangars and two industrial plants are a part of the project—all laid out and planned for future development, including provision for future widening of runways.

The United Airport is an Austin project *in toto*. Preliminary surveys and complete plans for the port as well as all construction work were handled by Austin Engineers. It is but one of many Austin aviation projects in 38 cities . . 22 states from coast to coast.

THE AUSTIN COMPANY . . . . Airport Engineers and Builders . . . . *Cleveland*

A NATIONAL ORGANIZATION WITH 15 BRANCH OFFICES FROM COAST TO COAST



FINEST LAMINATED GLASS MADE . . . . . and proof against shocks of forced landings . . . . . .

LANDINGS on rough fields lose much of their danger when your plane is equipped with non-shatter glass made by the Duplate Corporation's new Creighton process. There are three types of this glass to choose from, providing a range of thicknesses, weights, and prices to meet every aviation requirement. Also, special *bent* laminated glass for cock-pit windshields.

Let us know your requirements. We'll send you full information about the line—as well as samples—promptly.

DUPLATE CORPORATION, GRANT BLDG., PITTSBURGH
Pittsburgh Plate Glass Co., Distributors
Convenient Branch Warehouses in all Leading Cities

Duplate

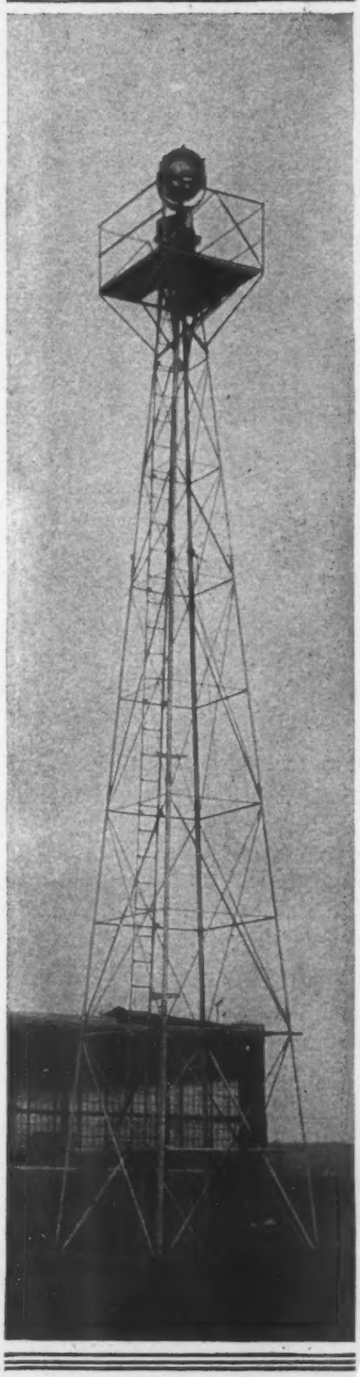
NON-SHATTER GLASS FOR AVIATION

DUPLATE
Plate glass, thinnest quality made. Overall thickness ¼ inch. Weight 48 ounces to the square foot.

AERO-LITE
The thinnest laminated glass made. ¼ to $\frac{5}{16}$ inches thick. Weight 24 to 25 ounces to the square foot.

DUO-LITE
Finest quality sheet glass, laminated to thickness of $\frac{5}{16}$ inch. Weight 45 ounces to the square foot.

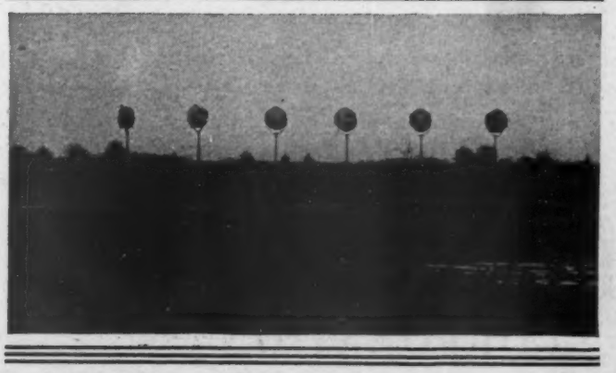
PONTIAC—THE FIRST A1A AIRPORT



A COMPLETE CROUSE-HINDS INSTALLATION

Pontiac, the first airport in the country to receive the official Department of Commerce A1A rating, is completely lighted with Crouse-Hinds airport lighting equipment.

The lighting equipment at Pontiac includes the landing field lights, the revolving beacon, the boundary, obstacle, and approach lights, the hangar exterior floodlights, the wind sock lighting fixture, the ceiling projector, the ceiling height indicator, and the floodlights for illuminating the concrete apron in front of the hangar.



CROUSE-HINDS

ESTABLISHED 1897

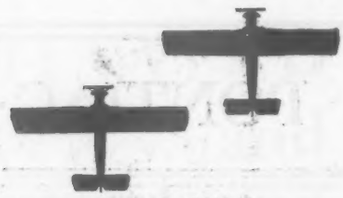
SYRACUSE, N. Y., U. S. A.

SALES OFFICES

NEW YORK, BOSTON, DETROIT, PHILADELPHIA, ATLANTA, MILWAUKEE, CHICAGO, ST. LOUIS, CLEVELAND, CINCINNATI, MINNEAPOLIS, PITTSBURGH, LOS ANGELES, SAN FRANCISCO, DALLAS, SEATTLE

CH 535

The ROBIN



An all-purpose plane at a moderate price..

FOR EVERYDAY all-weather flying, the Robin continues as America's most popular plane. There is hardly an airport worthy of the name where Robins are not a familiar sight and always in demand. Built for hard service, they answer the needs of the commercial or private flyer with the same reliability that enabled the "St. Louis Robin" to win the world's endurance record by staying aloft 420 hours—a record which still remains unbroken after 12 months.

Pilots like the Robin's ease of control. They note, with favor, its low landing speed and economical fuel consumption. They appreciate its exceptional visibility, the efficiently arranged controls, and the instrument panel complete with every device to make flying easier and safer.

Passengers delight in the comfortable cabin, with its automobile-type doors and windows, its deep-cushioned seats, upholstered walls and carpeted floor.

Robin Prices Are Low

Robins values are outstanding for planes as finely equipped. Note these exceptionally low prices:

ROBIN 3-PLACE CABIN MONOPLANE with 90 h.p. Curtiss OX5 engine, speed up to 100 m.p.h., cruising range 456 miles $2,495

ROBIN 3-PLACE CABIN MONOPLANE with 165 h.p. Wright Whirlwind engine, speed up to 118 m.h.p., cruising range 438 miles $5,995

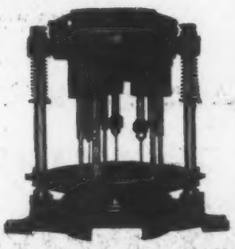
ROBIN 4-PLACE CABIN MONOPLANE with 185 h.p. Curtiss Challenger engine, speed up to 118 m.p.h., cruising range 525 miles $7,995

(This model equipped with dual controls)

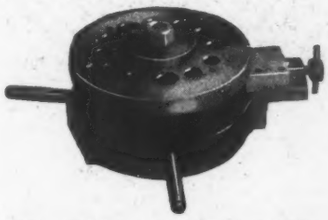
◆ ◆ ◆

No need to put off for another year the pleasures and profits that may be gained now by the ownership of a Robin. Without cost or obligation, business concerns, commercial operators and individuals will be supplied with full details regarding the Robin, and a demonstration arranged. Address Dept. R-73, Sales Division, Curtiss-Wright Corporation, 27 West 57th St., New York.

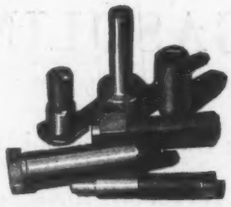
CURTISS-WRIGHT
CORPORATION



Krueger Multiple Drilling Equipment is designed and built to meet specific drilling, reaming, and tapping requirements.



The Wayne Division produces dies, jigs, fixtures, and special equipment. All products are made to specification.



The Wolverine Division is devoted exclusively to the production of special automatic screw machine products.

The Continental Division offers a complete line of counterbores, ground taps, milling cutters, and special tools.

EX-CELL-O ANNOUNCES

The Acquisition of the Following Companies Whose Products Now Form a Part of the Ex-Cell-O Group:

H. R. KRUEGER & CO.

Multiple Drilling Equipment

WAYNE TOOL CO.

Dies, Jigs, Fixtures

WOLVERINE SCREW CO.

Special Automatic Screw Machine Products

CONTINENTAL TOOL WORKS

Counterbores, Ground Taps, Milling Cutters

These four companies, each a specialist in its particular field, bring to Ex-Cell-O not only a group of distinguished products, but years of experience and a reputation for quality, dependability, and value which is completely in keeping with Ex-Cell-O tradition.

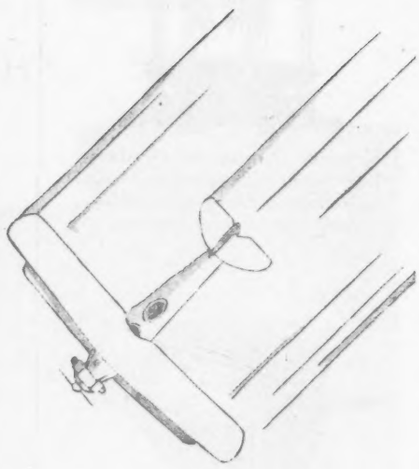
XLO-XLO

1200 OAKMAN BLVD.

EX-CELL-O *Aircraft* XLO *& Tool* Corporation

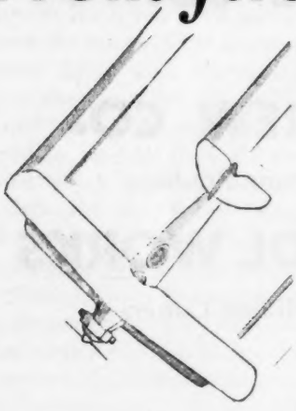
XLO-XLO

DETROIT, MICHIGAN



Donald Woodward Airport, Le Roy, N. Y.

From first time up till pilot's license



SOCONY AVIATION GASOLINE

The Donald Woodward Flying Service was the first school in the East approved by the Department of Commerce. Its record for students passing the Department of Commerce license tests in 1929 was 100%. It maintains 24 planes in equipment. Socony Aviation Gasoline is used exclusively at this airport.

This is but one of many schools and airports in New York and New England in which Socony Aviation Gasoline has been designated as the official fuel. Merit alone won it this preference, for Socony Aviation Gasoline and Socony Aircraft Oil were built to meet flying's severest tests.

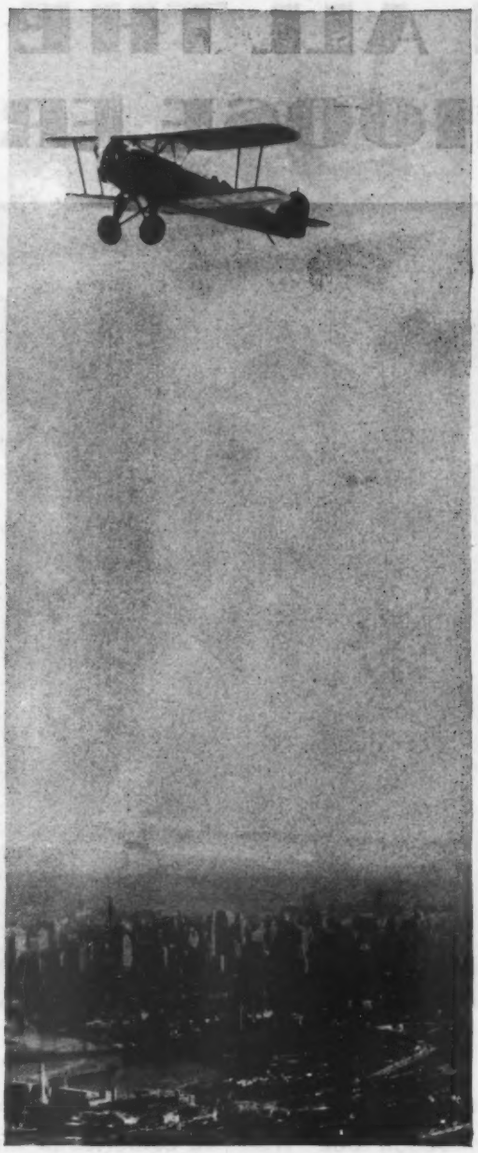
Could there be any better proof that the Socony sign is a guarantee that the petroleum products sold there are entirely dependable?

SOCONY

AVIATION GASOLINE **AIRCRAFT OIL**

STANDARD OIL COMPANY OF NEW YORK

SPORT
BUSINESS
AIRMAIL



PITCAIRN

SPORT MAILWING

Roomy three-place plane (pilot and 2 passengers). Forward cockpit equipped with Dual Controls. Full complement of instruments. Ample baggage space. Top speed 145 m. p. h., cruising speed 120 m. p. h. Wright Whirlwind J-6 225 h. p. engine.

Price fly-away factory $8000

UNCOMPROMISING insistence upon quality distinguishes the Pitcairn viewpoint on plane-building just as definitely today as it did in the early days of Pitcairn pioneer work in aviation. Now, as then, the central thought which guides the conception and construction of a Pitcairn ship is quality.

Pitcairn Mailwings attest the success with which Pitcairn ingenuity, engineering skill, flying experience and craftsmanship were focused upon that one aim of achieving quality in the highest degree. And that quality is balanced. Sturdiness, speed, stability . . . no one characteristic is allowed to overshadow any other. Nor does Pitcairn tolerate the slighting of a single detail of construction. No Pitcairn ship was ever built to a price.

The first crucial test came when commercial operators took over the flying of Government mail . . . and the Pitcairn ideal was proved of practical value. The Mailwing met each of the many most stringent Government requirements for mail carrying by night and day, regardless of weather. It was the balanced quality of the Pitcairn ships that brought to owner and pilot dependable performance. And that performance, in turn, solved the innumerable problems with which they were confronted in this service.

Pitcairn Mailwings today fly on twelve different air-mail lines in the United States and Canada on a schedule of over 10,000 miles each day. And the ship now has to its credit more than 8,000,000 air-miles of safe flying.

Such is the heritage of the Pitcairn Sport Mailwing . . . fleet sister-ship to the veteran Mailwing. It offers you the same infinite precision in every detail . . . the same sturdiness . . . the same ease of handling . . . the same fine stability which makes for effortless control and true, smooth flying.

Your pleasure in owning and operating a Pitcairn Sport Mailwing will be immeasurably heightened by the keen beauty of its line and its complete comfort. Pitcairn Aircraft, Incorporated, Pitcairn Field, Willow Grove, Pa.

PITCAIRN

WITH ALL THE PAST TO CHOOSE FROM . . .

IN our youngest industries—radio and aviation—oxwelding is a standard production tool. With two centuries of manufacturing practice to draw from, each has chosen oxwelding as the modern method of high-speed production at low cost.

Oxwelding is ideally suited to routine manufacturing operations. It is readily adaptable to rapid increases in production and frequent or unforeseen changes in design.

It is applicable to the widest range of materials—steel and the ferrous alloys—aluminum, brass, bronze, and practically all other non-ferrous metals and alloys.

THE LINDE AIR PRODUCTS COMPANY . . . THE PREST-O-LITE COMPANY, INC. . . . OXWELD ACETYLENE COMPANY . . . UNION CARBIDE SALES COMPANY,

Units of

UNION CARBIDE AND CARBON CORPORATION

General Offices . . New York UCC **Sales Offices in the Principal Cities**

65 Linde plants . 48 Prest-O-Lite plants . 174 Oxygen Warehouse stocks . 156 Acetylene Warehouse stocks . 42 Apparatus Warehouse stocks . 245 Union Carbide Warehouse stocks

Announcing

a significant step forward in the task of providing vital information for the men who are and will be the backbone of the aviation industry

Beginning with the August Issue

AVIATION

INAUGURATES

A MORE IMPROVED SERVICE

TO expand and intensify AVIATION's service and to keep a step ahead of the growing needs of the industry, AVIATION will *change* and *add* to its publishing service after the weekly issue of July 5th.

Commencing with the August issue, AVIATION will be issued as a *monthly* publication. It will be larger, more colorful, more thorough.

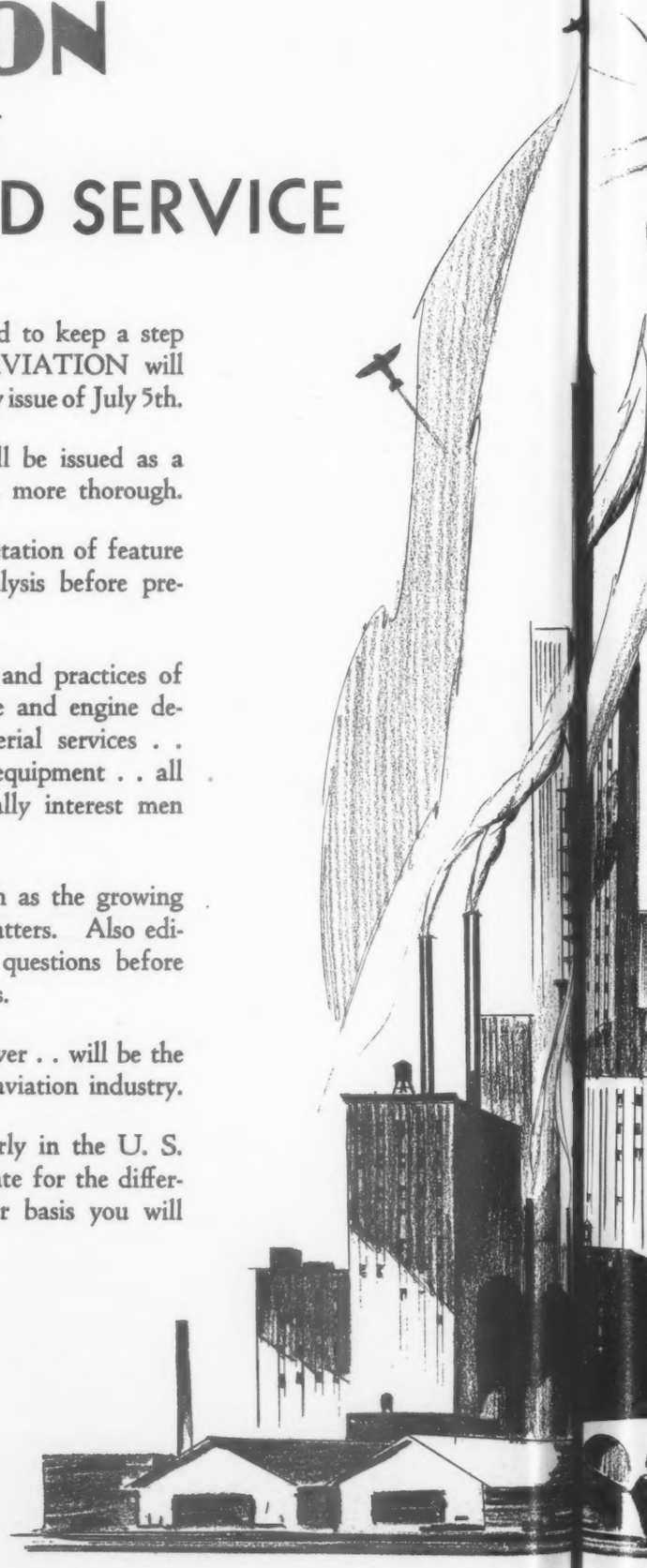
Monthly publication will permit a more mature interpretation of feature article material that calls for detailed study and analysis before presentation.

AVIATION will continue to be devoted to methods and practices of plane and engine production . . developments in plane and engine design . . operation of airports, transport lines and aerial services . . sales and merchandising problems . . maintenance of equipment . . all the thousand and one "hows" and "whys" that vitally interest men in aviation.

More space will be devoted to specialized features such as the growing importance of airports, transport lines and financial matters. Also editorials expressing definite opinions on the important questions before the industry and a digest of the month's aviation news.

After 14 years of service, AVIATION . . more than ever . . will be the beacon light for those who want the real *facts* on the aviation industry.

Subscription price of the new monthly will be $3 yearly in the U. S. All domestic subscriptions will be extended to compensate for the difference in the subscription price. On a dollar-for-dollar basis you will receive full value.



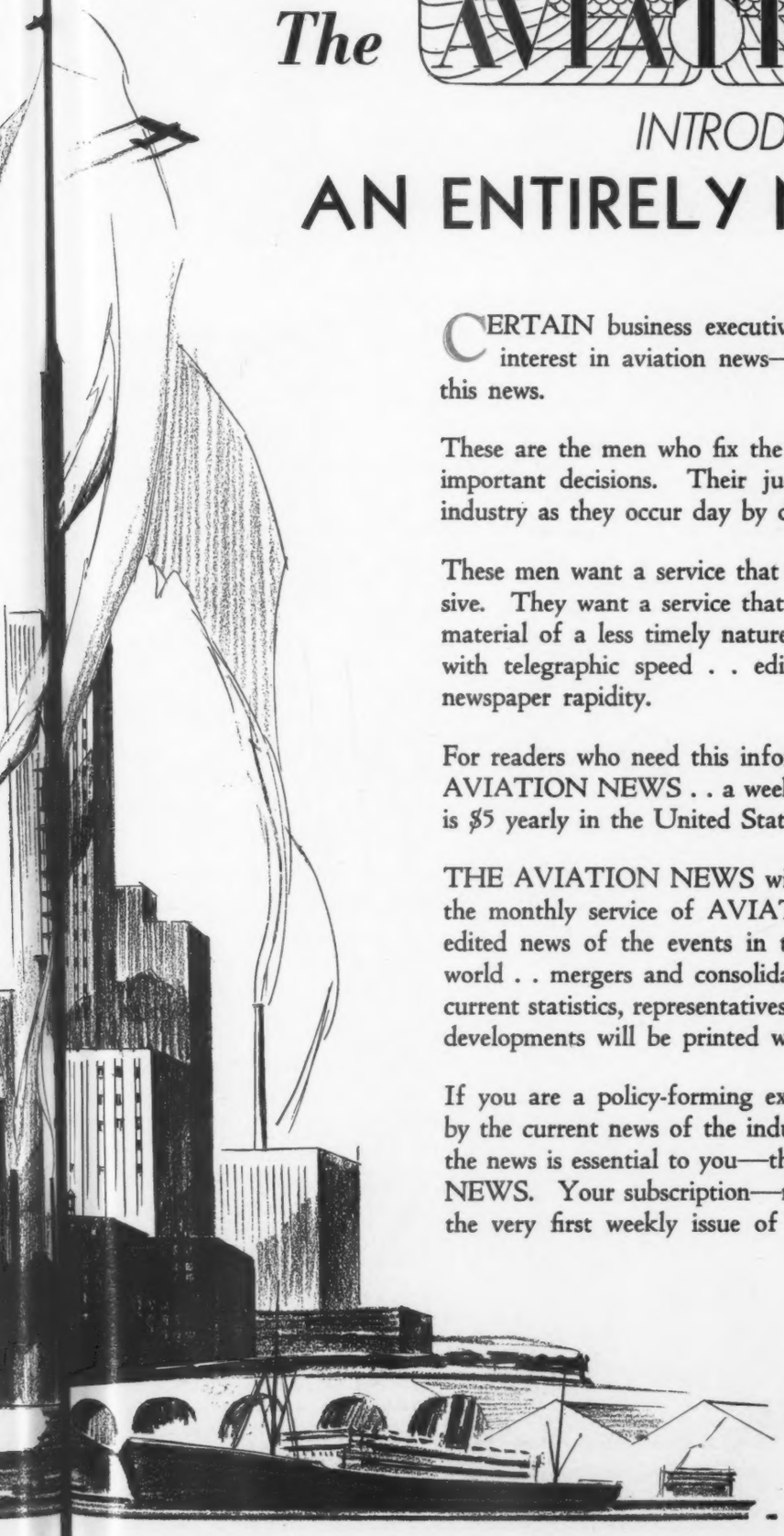
ISSUED MONTHLY... *Subscription Price - $3 Yearly in U. S.* CANADA MEXICO
$6 in Central and South America; $8 elsewhere

Beginning with the July 12th Issue

The AVIATION *News*

INTRODUCES

AN ENTIRELY NEW SERVICE



CERTAIN business executives—and other readers with a primary interest in aviation news—must have a quick, reliable source of this news.

These are the men who fix the policies of their organizations or make important decisions. Their judgment is influenced by events in the industry as they occur day by day and week by week.

These men want a service that is swift . . authoritative . . comprehensive. They want a service that isolates the news from all conflict with material of a less timely nature . . a service that will gather the news with telegraphic speed . . edit it carefully . . and present it with newspaper rapidity.

For readers who need this information, McGRAW-HILL presents THE AVIATION NEWS . . a weekly reporting service. Subscription price is $5 yearly in the United States.

THE AVIATION NEWS will be a real news service, supplementing the monthly service of AVIATION. It will contain complete, well-edited news of the events in the industry as they occur all over the world . . mergers and consolidations, significant flights, financial news, current statistics, representatives appointed, foreign notes, etc. Technical developments will be printed when they are *news*.

If you are a policy-forming executive . . if your activities are shaped by the current news of the industry . . if accuracy and completeness in the news is essential to you—then you should read THE AVIATION NEWS. Your subscription—mailed today—will insure your receiving the very first weekly issue of this news service.

ISSUED WEEKLY... *Subscription Price - $5 Yearly in U.S.* CANADA MEXICO

$6 in Central and South America; $8 elsewhere

WHO ARE THE EDITORS?

EDWARD P. WARNER

Edward P. Warner — *Editor-in-chief*

Former Assistant Secretary of the Navy for Aeronautics; former Professor of Aeronautical Engineering at Massachusetts Institute of Technology; author of "*Aerostatics*" and "*Aerodynamics of Airplane Design.*"

R. Sidney Bowen, Jr. — *Managing Editor*

With the Royal Flying Corps during war; 2500 hours in air; former political reporter for London newspapers; former assistant editor of *Marine Journal* and *Motor World.*

Leslie E. Neville — *Technical Editor*

Herbert F. Powell — *News Editor*

Charles H. Gale
Assistant Editor

Charles F. McReynolds
Pacific Coast Editor

Charles E. Noyes
Foreign News Specialist

John T. Nevill
Detroit

Henry O. Pattison, Jr.
Assistant Technical Editor

James P. Wines
Chicago

Also more than 100 regular correspondents in America and abroad, tapping sources of vital aviation news.

R. SIDNEY BOWEN, JR.

LESLIE E. NEVILLE

HERBERT F. POWELL

WHAT IS BACK OF THEM?

Behind AVIATION and THE AVIATION NEWS are the great editorial and financial resources of the McGRAW-HILL PUBLISHING COMPANY.

They draw for facts and figures on a thousand far-flung sources. Wherever developments in aviation are going on, you will find an outpost of McGRAW-HILL. Our editors and correspondents tap sources of information such as no other publication can.

These many points of contact insure accurate, authoritative information for you. Not empty theory, but the plain, hard *facts.*

AVIATION and THE AVIATION NEWS act as the clearing houses for information as to progress and achievements. Wherever new ideas or new methods are evolved, wherever new designs are developed, the complete story will be secured for their pages.

McGraw-Hill Building at New York (*in white circle*) with the Los Angeles and two Navy blimps flying over it.

Business men, industrialists and engineers—600,000 of them—regularly read the McGRAW-HILL Publications.

THE BUSINESS WEEK
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FACTORY & INDUSTRIAL MANAGEMENT
ENG. & MINING WORLD
POWER
TEXTILE WORLD
INDUSTRIAL ENGINEERING
ELECTRONICS
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AMERICAN MACHINIST
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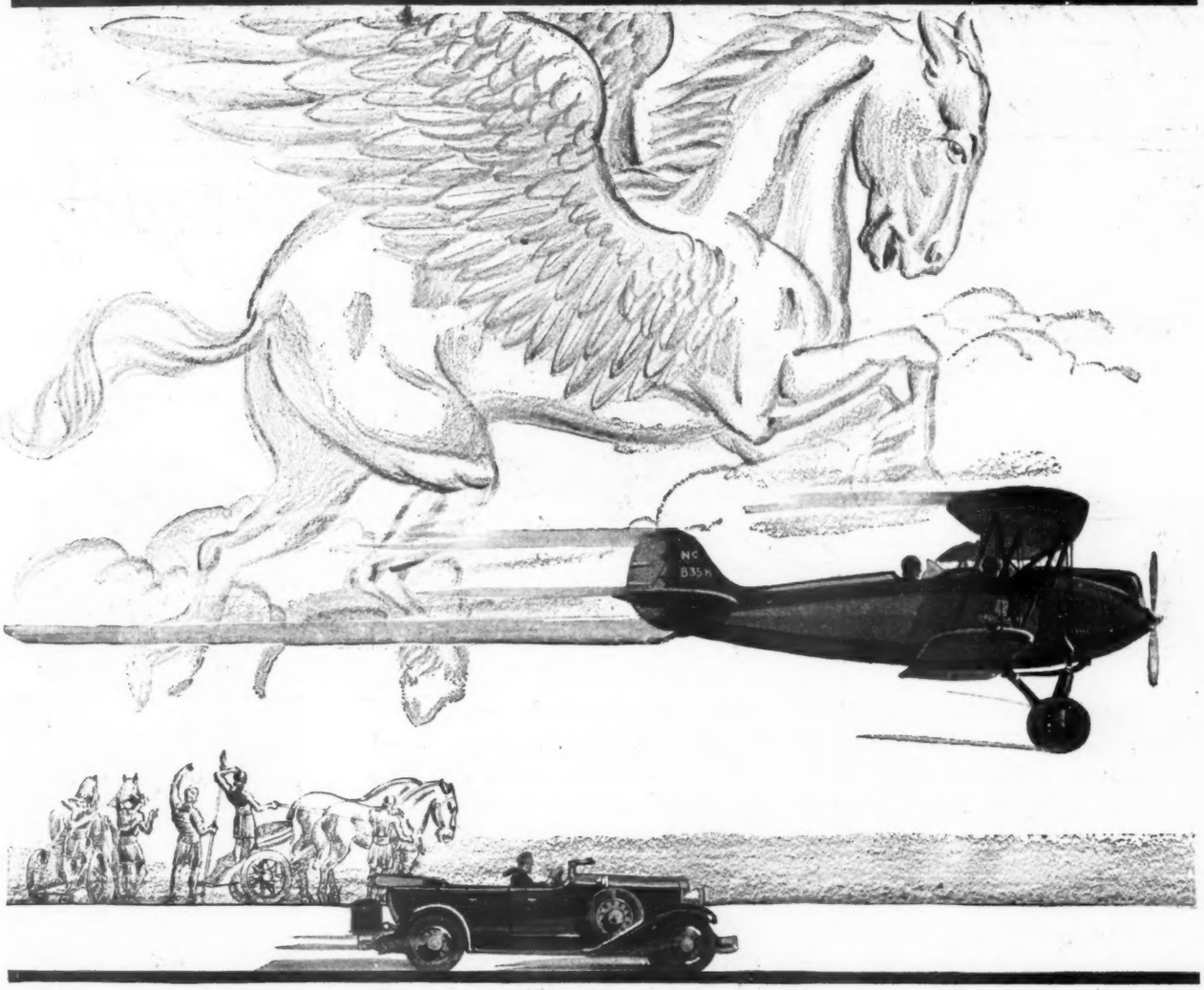
GREAT LAKES SPORT TRAINER



You Can Sell This Ship . . . *Favorite of Discriminating Buyers Everywhere*

No other light ship has so instantaneous an appeal to the discriminating flyer as the Great Lakes Sport-Trainer. Its low price and remarkable performance; its stunning appearance and advanced engineering features combine to make the Sport-Trainer the fastest selling ship on the market today! *You* can sell this ship! There's a handsome profit in it for you. The Great Lakes franchise is a money-making proposition; the added features of our Operating-Dealer plan are sure-fire profit makers for any keen, wide-awake, and experienced business-aviator. A number of territories are open. Write us a detailed account of your experience and your plans and tell us something of flying conditions in your community. Address: GREAT LAKES AIRCRAFT CORPORATION, Cleveland, O.

Manufactured under U. S. Department of Commerce Approved Type Certificate No. 228

FLY AWAY $3150 CLEVELAND

GREAT LAKES AIRCRAFT
CORPORATION CLEVELAND
Contractors to the United States Army and Navy

772 hours per month via TRAVEL AIR transport

A Travel Air 6-place cabin monoplane clocks its passenger line schedule through Texan skies.

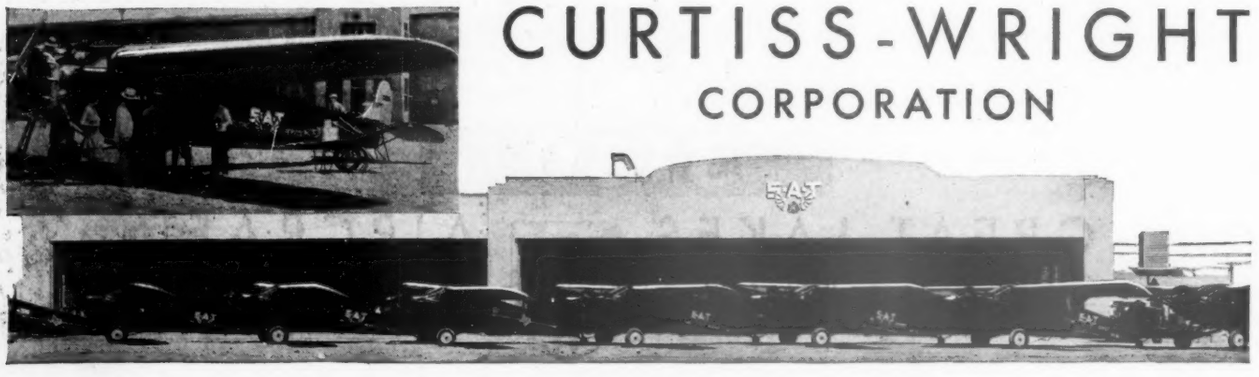
Jerry Marshall, Operations Manager of Southern Air Transport, Inc.

THE Lone Star State is now splendidly served by the air line system of Southern Air Transport. The S. A. T. fleet of twelve 6-place Travel Air cabin monoplanes flying nearly a million miles a year on schedule have reduced by two-thirds the former traveling time between principal Texan cities.

Jerry Marshall, Operations Manager of S. A. T., reviews Travel Air performance with these facts: "We are at this time using twelve Travel Air J6-9, 6-place cabin monoplanes on our regular passenger lines in Texas. These ships have been flying approximately 772 hours, or 74,085 miles, per month with very satisfactory results. They are highly favored by the pilots, the maintenance personnel, and thousands of passengers who travel swiftly in safety and comfort over our lines."

Travel Air cabin monoplanes have repeatedly proven their superior qualifications in passenger, express and charter service. Their consistent performance and low operating cost make profits possible at reasonable rates. Their reliable Wright Whirlwind power plants, inherent stability, ease of handling, all-weather efficiency and low maintenance cost have made them the choice of leading transportation companies throughout America.

Write for specifications, performance data and operating costs which will be supplied without obligation. Address your letter to Dept. TA-73, Sales Division, 27 W. 57th St., New York.



CURTISS-WRIGHT
CORPORATION

FAMOUS FLIGHTS WITH THOMPSON VALVES

in the "Spirit of St. Louis"

(This advertisement is one of a series recalling historic airplane flights in which Thompson Valves were used.)

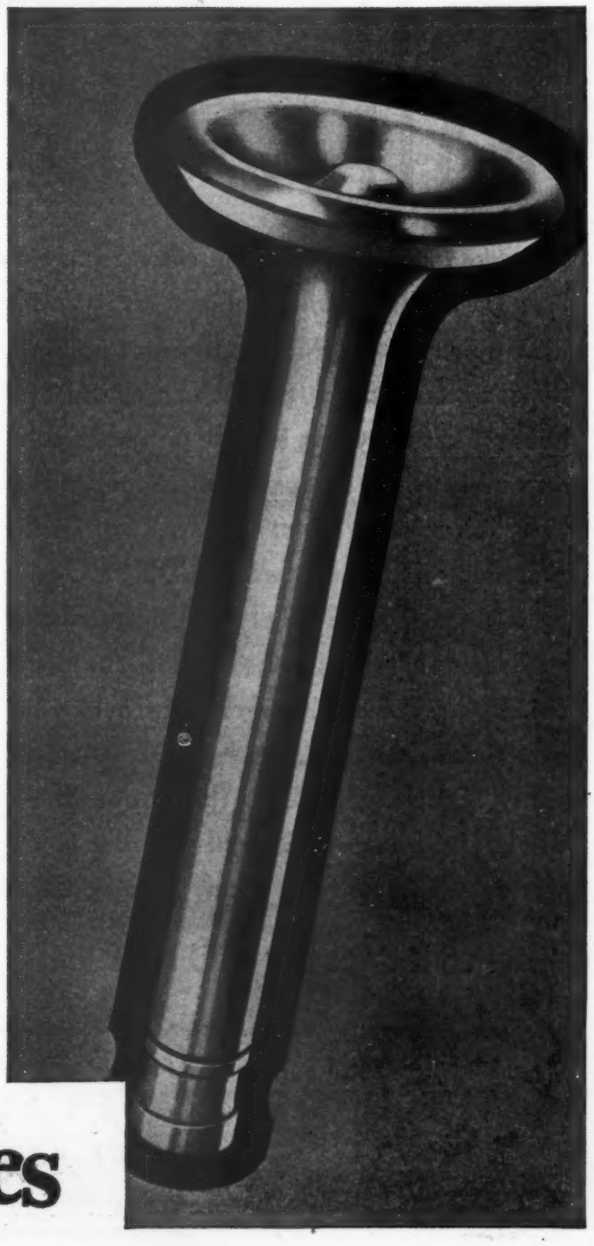
IT is only three short years since a lone man left the coast of America and completed the first trans-Atlantic solo flight. The brilliant feat of this skillful, daring pilot has won unprecedented fame the world over.

In the world of aeronautics, the perfect performance of this pilot's plane, its engine and every engine part established an equally brilliant record of utter dependability.

Contributing largely to the success of this famous flight was the unfailing performance of the Thompson Valves that controlled the operation of the engine in the "Spirit of St. Louis."

And this is only one of the many outstanding achievements of Thompson Valves that have led to their specification in today's finest American airplane motors.

THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT



Thompson Valves

THE GOOD MECHANIC'S CHOICE

AIR MINDED

JUST like today's most modern aircraft! This trim little U. S. ¼-inch drill combines strength with light weight (only 5¾ pounds)—accomplished by one-piece Bohnalite frame and commutator housing. Easy servicing is made possible by the removable handle side and commutator housing. Powerful universal motor (for A. C. or D. C.) provides full rated power UNDER LOAD, 2,000 r.p.m. Chrome nickel steel gears, hardened and running in grease, insure long life. The trigger switch is proof against shorts. Also like the best aircraft, this U. S. drill is well balanced, easily handled and quiet. This is true of the whole U. S. line—oldest and broadest in the world. Whatever you need, specify U. S.

» ASK YOUR JOBBER «

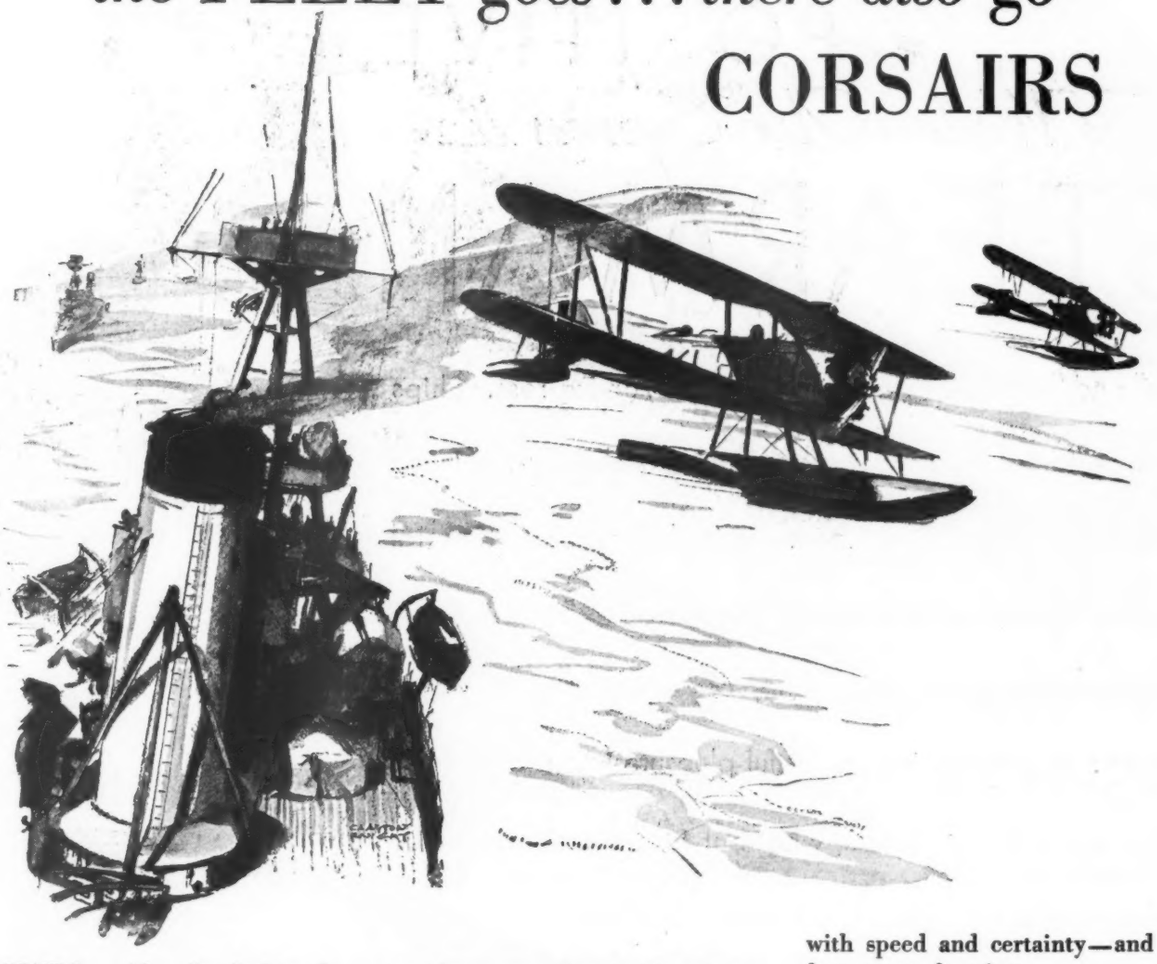
THE UNITED STATES ELECTRICAL TOOL COMPANY

2466 West Sixth Street, Cincinnati, Ohio, U. S. A.

Export Sales Representatives—WESTINGHOUSE ELECTRIC INTERNATIONAL CO.—150 Broadway, New York City

Canadian Division—MAPLE LEAF ELECTRIC TOOLS, Ltd.—Toronto

Where the FLEET *goes . . . there also go* CORSAIRS



IT MAY be with a battleship. It may be on an aircraft carrier. But wherever the United States Fleets go there are sure to be *Corsairs.*

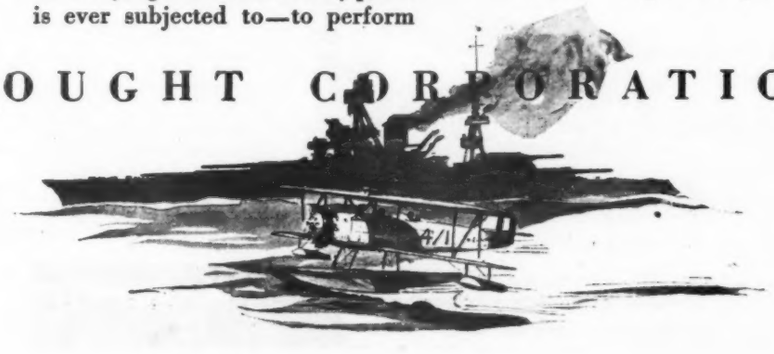
The *Corsair* above (No. A-7831) has already seen service with the U. S. S. California, flagship of the Pacific Fleet, the U. S. S. Idaho and land duty at San Diego.

A *Corsair*, like a sailor, never knows to what ship it will go or what duty will be asked of it. It must be prepared to stand up under the strain of catapult launchings from a battleship. To withstand the severe pounding of rough sea landings. To make quick take-offs from aircraft carrier decks. To give absolutely dependable service in emergencies of every kind.

That is why *Corsairs* have been built to perform under conditions more trying than the ordinary plane is ever subjected to—to perform with speed and certainty—and to *keep on* performing.

Corsairs today are carrying out some of the most difficult assignments which can be given to airplanes in naval air usage. Their successful record has made them the standard of observation planes in the U. S. naval air forces. CHANCE VOUGHT CORPORATION, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.

CHANCE VOUGHT CORPORATION

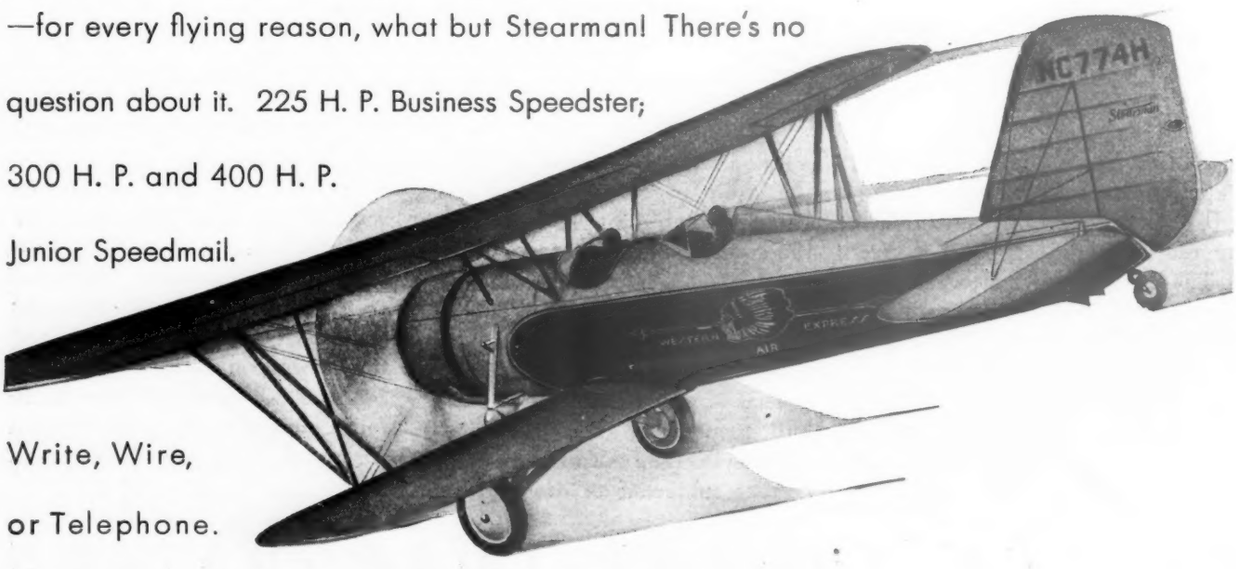


TO BE POSITIVE

(As Western Air Express is—)

STEARMAN

"Ifs" and "buts" don't go with Western Air Express. Ships must perform in perfect harmony with a sharply-set flying tempo. . . . You'll find Stearmans in their service. (Several in continuous use for over two years.) ¶For everyday schedules or just that optional hop of yours which has to pack a world of exhilarating yet restful pleasure into every minute —for every flying reason, what but Stearman! There's no question about it. 225 H. P. Business Speedster; 300 H. P. and 400 H. P. Junior Speedmail.



Write, Wire, or Telephone.

STEARMAN AIRCRAFT COMPANY, WICHITA, KANSAS

Division of United Aircraft and Transport Corporation

Junior Speedmail, Model 4-D, Wasp Junior powered, in Western Air Express service

SMOOTHNESS

Smoothness is an almost indefinable element in an engine. It is the "feel" that satisfies the pilot's sixth sense. It is the "plus factor" that distinguishes Continental Aircraft Engines. Countless pilots say "The smoothest engine I've ever flown." There can be no finer tribute to intelligent design, quality materials, expert workmanship—and precision. The four cardinal points of practical aircraft power are smoothness, dependability, economy, and convenience. All result from the same basic fundamental of construction — precision. Continental Aircraft Engines are almost unbelievably "smooth" because they are Precision Built. Continental is producing Practical Aircraft Power.

"Approved Type Certificate No. 32, U. S. Department of Commerce"

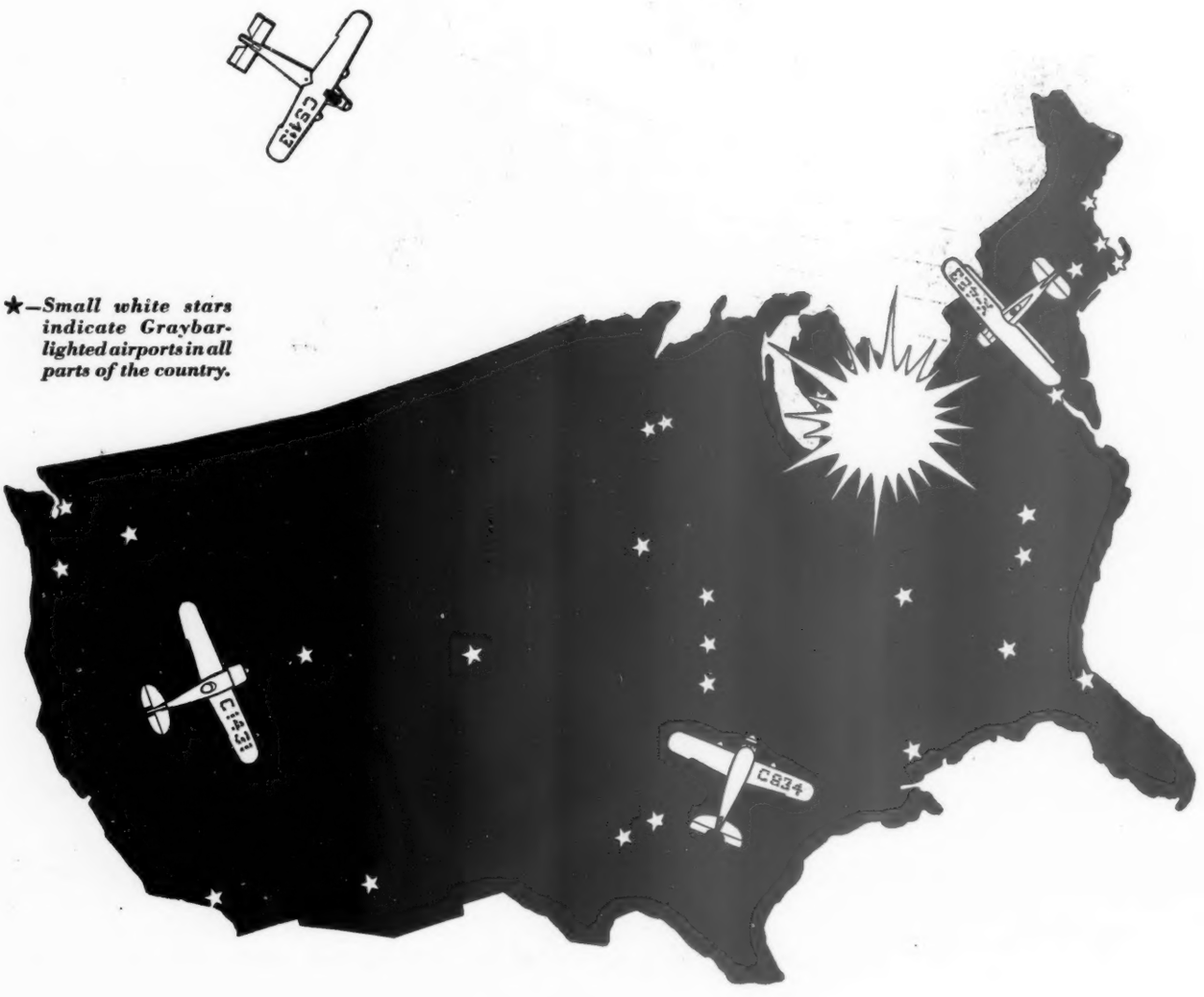
CONTINENTAL AIRCRAFT ENGINE CO.

General Office and Factory: Detroit, Michigan

Continental Engines

Drawing upon the facilities and experience of the greatest engine builder in the world, Continental is uniquely enabled to counsel with the trade in the design and production of engines to fit individual requirements.

Tune in on the Graybar Program at 10 P.M., Eastern Daylight Saving Time, every Tuesday . . . . . Columbia Broadcasting System.

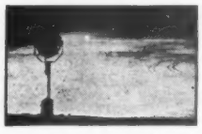


★—*Small white stars indicate Graybar-lighted airports in all parts of the country.*

It's Toledo . . .

It's easy to find by night . . . It's easy to land upon . . . It's a well-lighted airport . . . It's a Graybar-lighted airport. ¶ Graybar has supplied equipment to light many other famous airports in every part of the nation. Graybar airport lighting specialists have helped to solve many a difficult technical problem in this field. These experts can help you solve *your* problems. Why not avail yourself of their services? Here's a coupon to point the way.

Toledo Hangar



Some typical examples of Graybar Airport Lighting.

GraybaR
AIRPORT LIGHTING
OFFICES IN 76 PRINCIPAL CITIES

---COUPON---

Graybar Electric Co., Graybar Bldg., New York. *Gentlemen:* Please send us more information on Airport Lighting. AV. 7-5

NAME _____ ADDRESS _____

Above—Seat Pack—Compact one piece water and dust proof combination pack cover and pilot.

Right—Cover resting on canopy after acting as pilot and releasing main chute.

Above—Shows comfortable back pack having all the advanced features of the Seat Pack. It is long and narrow and fits snugly to the back. Both packs are fitted with pull ring on side in natural accessible position.

SWITLIK

SAFETY CHUTE

A SURE ACTING, FOOL PROOF PATENTED PACK OF PROVED QUICKER OPENING

This famous combination one piece cover pack is patented, controlled and manufactured only by the Switlik Co. at Trenton, N. J.

Because of its tremendous popularity and proved superiority others are trying to imitate this pack. So we wish to repeat: The original Safety Chute as pictured above is manufactured only by us. Write or wire today for illustrated booklet and special offer.

SWITLIK SAFETY CHUTES ARE USED BY DEPT. OF COMMERCE OFFICIALS—AIR MAIL PILOTS — EUROPEAN GOVERNMENT OFFICIALS AND MANY FAMOUS FLYERS

SWITLIK PARACHUTE & EQUIPMENT CO.

BROAD AND DYE STS., TRENTON, N. J.

In 1930 general magazine advertising...for passenger cars

REO

features *Nickel Cast Iron* cylinder blocks

"GOOD *for* 100,000 *miles*"

THE SATURDAY EVENING POST

Reo is happy to note the trend on the part of the public. Reo has never neglected style, but Reo has never, in the 28 years of its history, built to a price. In the very beginning, Reo set for itself one rigid standard—from which Reo has never wavered. That standard is to make Reo good for 100,000 miles—to make a car you will enjoy driving and be proud to drive for a full 100,000 miles.

RICHARD H. SCOTT,
PRESIDENT

Why RE
GOOD for 100,000

Each Reo part is built to withstand a strain 200% greater than you will ever put it to will ever undergo in actual service.

By spending from 10% to 25% more for ... often possible to secure 100% larger ... assuring perfect results that otherwise ...

Reo's axles are so sturdy—Reo springs ... they can withstand a shock equivalent to ... Reo off a four-foot drop at 60 miles an ...

Reo uses only "live" metal in its ... gage—no scrap metal is tolerated.

Reo's 7-bearing crankshaft, flywheel, ... drums—even Reo's fan blades—are ...

The car illustrated above is the Reo Flying Cloud ... Model 28 ... Sport Coupe ... Reo prices range from $1195 to $1670, f. o. b. Lansing, Michigan.

REO MOTOR CAR COMPANY
Lansing, Michigan

REO FLYING CLOUD
GOOD
for 100,000 miles

A chrome-nickel cylinder block with seven times the endurance of the ordinary iron block, immensely reducing valve seat wear and the need of valve grinding and valve tappet adjustment.

(From The Saturday Evening Post—January 11, 1930)

This is a reproduction of one page of the double-page advertisement in The Saturday Evening Post which featured the Chrome-Nickel Iron cylinder blocks in Reo Flying Cloud models.

AGAIN, the Reo Motor Car Company features Nickel Iron... Reo is the *first* manufacturer of passenger automobiles to feature a Chrome-Nickel Iron engine block in national magazine advertising!

Previously Reo "Speedwagon" advertising, in The Saturday Evening Post, described Nickel-chrome alloy iron as "the longest wearing cylinder material known today".

Now...in 1930 general magazine advertising for Flying Cloud models, Reo states: "A chrome-nickel cylinder block with seven times the endurance of the ordinary iron block".

More and more, leading manufacturers of quality products, and the general public as well, appreciate the far-reaching significance of standardizing on such improved materials as Chrome-Nickel Cast Iron. Uniformly high hardness... freedom from hard spots...finer grain...greater toughness...unusual wear-resistance...these are the characteristics of Chrome-Nickel Cast Iron that make this modern material particularly suited to automotive cylinder castings.

Consequently, longer wearing Nickel-Chrome Iron cylinder blocks are contributing toward the production of a Reo Flying Cloud that is "good for 100,000 miles."

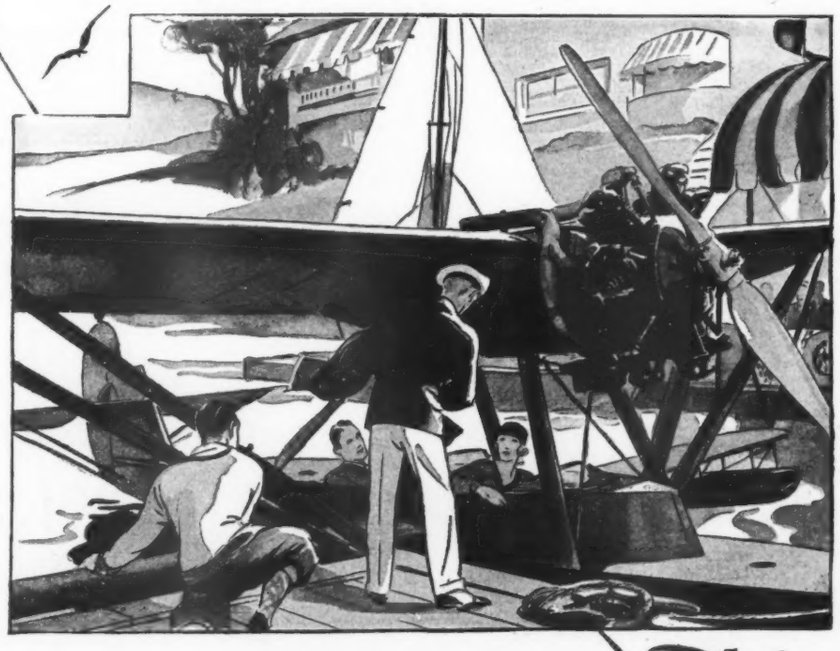
Nickel
FOR CAST IRON

INCO NICKEL

Our foundry specialists will gladly discuss your casting problems with you

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

. . a new thrill for passengers . . . a speedboat that flies



EASTMAN *Flying Yacht*

Passenger-hopping with an Eastman Flying Yacht offers new opportunities for profit to operators near lakes or sea side. ¶ Passengers are attracted by over-water flying. They enjoy the thrill of skimming the surface and mounting quickly into the air, without dust and dirt. And they like to know that a continuous "landing field" is always below. That is one reason Eastman operators can charge *twice the regular tariff for every ride.* ¶ The Eastman accommodates three passengers and pilot in comfort. On the water it steers like a boat, and can be quickly brought around for loading and unloading—which means more trips per hour. In take-off and performance, it compares with a sport-plane. It leaves the water in 8 to 12 seconds—climbs 1000 to 1200 feet per minute. ¶ Powered by a 170 H. P. engine the Eastman lists at $9985. Its all-metal hull and rugged construction throughout assure long life and dependable service. ¶ The summer months will bring a golden harvest to Eastman operators. Write for our illustrated catalog and complete information. Our sales franchise will interest dealers.

EASTMAN AIRCRAFT CORPORATION
RYAN AIRCRAFT CORPORATION
LOCKHEED AIRCRAFT CORPORATION
AIRCRAFT PARTS CO., INCORPORATED
PARKS AIR COLLEGE, INCORPORATED
PARKS AIRCRAFT CORPORATION

DETROIT AIRCRAFT

FORT AND CAMPAU STREETS, DETROIT

Chanin Bldg., New York — Roosevelt Bldg., Los Angeles

BLACKBURN AIRCRAFT CORPORATION
AIRCRAFT DEVELOPMENT CORPORATION
MARINE AIRCRAFT CORPORATION
GROSSE ILE AIRPORT, INCORPORATED
GLIDERS, INCORPORATED
DETROIT AIRCRAFT EXPORT CORP.

IN SPITE of their extra strength, Fairchild KR Biplanes offer the advantages of a high ratio of disposable load. The added sturdiness — which is vitally important in training and sport flying — is achieved not by adding weight to the structure, but by designing it carefully and choosing proper materials. The most rigid specifications are used. Chrome molybdenum steel, famous for its combination of strength and lightness, is used for many parts. The result is that the penalty is lifted from strength and the power of the engine used not to haul a heavy structure, but to carry useful loads.

Speed, climb, economy — everything you include under the head of Performance — are built into these planes, as well as surplus stamina. They satisfy the professional pilot, being used for training purposes everywhere. Scores have been sold for military uses. Private pilots like them for the complete confidence they inspire, confidence in the take-off, confidence in the air, confidence when landing.

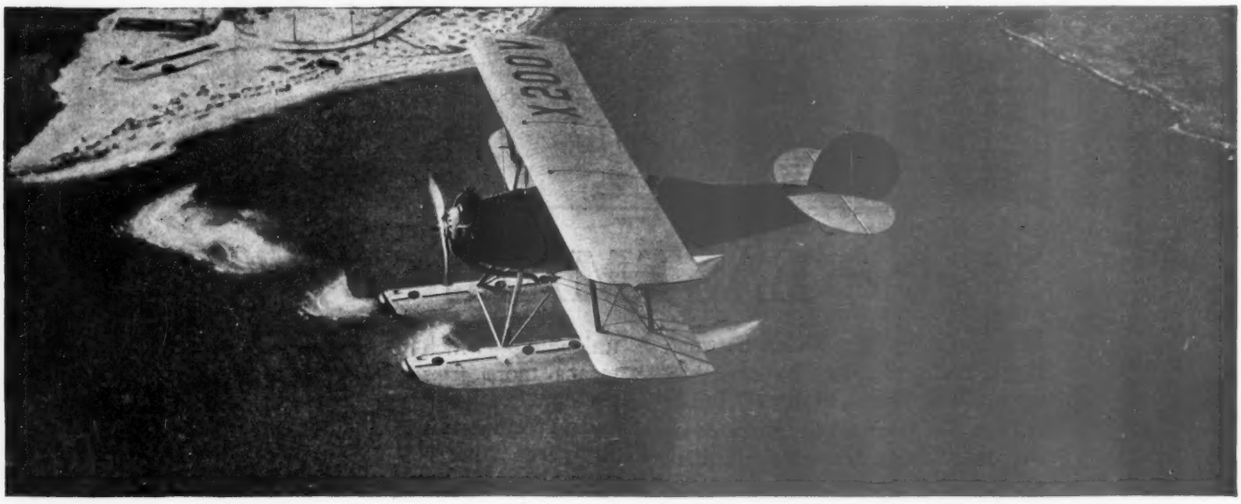
Fairchild KR performance and strength cost you no more. Prices, including remarkably complete equipment, are set at figures that make these ships unusually attractive to the average pilot and his pocketbook. A comprehensive booklet giving complete information will be mailed to you on request.

Strength *without* penalty

FAIRCHILD AIRPLANE MANUFACTURING CORP.

Plants:
Farmingdale, N.Y. Hagerstown, Md.
Longueuil, P. Q., Canada

Export offices: 122 East 42nd Street, New York
Division of The Aviation Corporation



FAIRCHILD KR-21 A. T. C. 215 TWO PLACE

Performance: Top speed, 113 m.p.h. Climb, 775 ft. p.m. Disposable load, 885 lbs.

Specifications: KR-21 TRAINER, $4125 flyaway FARMINGDALE

Kinner 100 h.p. engine and wood propeller. Oleo landing gear. Bendix brakes may be installed at slight additional cost. Air wheels with brakes also obtainable at slight extra cost. Complete equipment: altimeter, gasoline gauge, booster magneto, tachometer, oil pressure and temperature gauges, dual controls, engine cover, tools, fire extinguisher, first-aid kit, engine instruction book, log book, celluloid inspection windows at all control bearing points, detaching pan.

KR-21 SPORTSTER, $4375 flyaway FARMINGDALE

Same equipment as the Trainer, plus upholstery, extra oil-pressure gauge, compass, airspeed indicator, propeller spinner and cockpit covers.

FAIRCHILD KR-34 A. T. C. 162 THREE PLACE

Performance: Top speed, 123 m.p.h. Climb, 800 ft. p.m. Disposable load, 885 lbs.

Specifications: Wright J-6, 165 h.p. engine and metal propeller. Oleo landing gear.

Bendix brakes may be installed at slight additional cost. Air wheels with brakes also obtainable at slight extra cost. Note really complete equipment; airspeed indicator, altimeter, compass, dash gasoline gauge, booster magneto, tachometer, dual controls, brakes, oil pressure and temperature gauges, cockpit covers, engine cover, log book, tools, first-aid kit, fire extinguisher, engine instruction book, wired for navigation lights. This plane can also be had with 165 h.p. Comet engine, which alters performance slightly and increases disposable load and economy. Price, with either engine, $6575 flyaway Farmingdale.

ALL PRICES ABOVE ARE FOR LAND PLANES

FAIRCHILD

KR BIPLANES

MOTO METER AVIATION INSTRUMENTS

CHARACTER

IN PILOTS—as in other men—it is quite obviously *character* that counts. *Character*—a word very hard to define, but that invariably makes its owner stand out from the general run.

If inanimate objects at all have something that may be called character, the Moto Meter line of aviation gauges has. But in products is it not also *the character of the organization behind them that counts?*

For nearly twenty years Moto Meter has made fine instruments. It has pioneered them and seen them become standard equipment. It has devoted constant effort toward making them simple, reliable and positive in operation.

Small wonder then that Moto Meter aviation instruments (some of which are illustrated below) are found on the panels of the big air liners, of much smaller commercial, private and service craft, and of the experimental planes that have carried so many names to fame.

Moto Meter aviation instruments in the pilot's cockpit are a sign of *character.*

Model 2893A Oil Pressure Gauge
(Illustrated above)
Built to stand vibration and shock.
Conforms to government specifications.

Model C Motor Heat Indicator
(Illustrated on left)
The finest instrument of its kind.
Conforms to government specifications.

Model CA Ice Warning Indicator
(Illustrated on right)
Warns pilot when atmospheric conditions favor formation of ice.

MOTO METER

GAUGE & EQUIPMENT CORPORATION

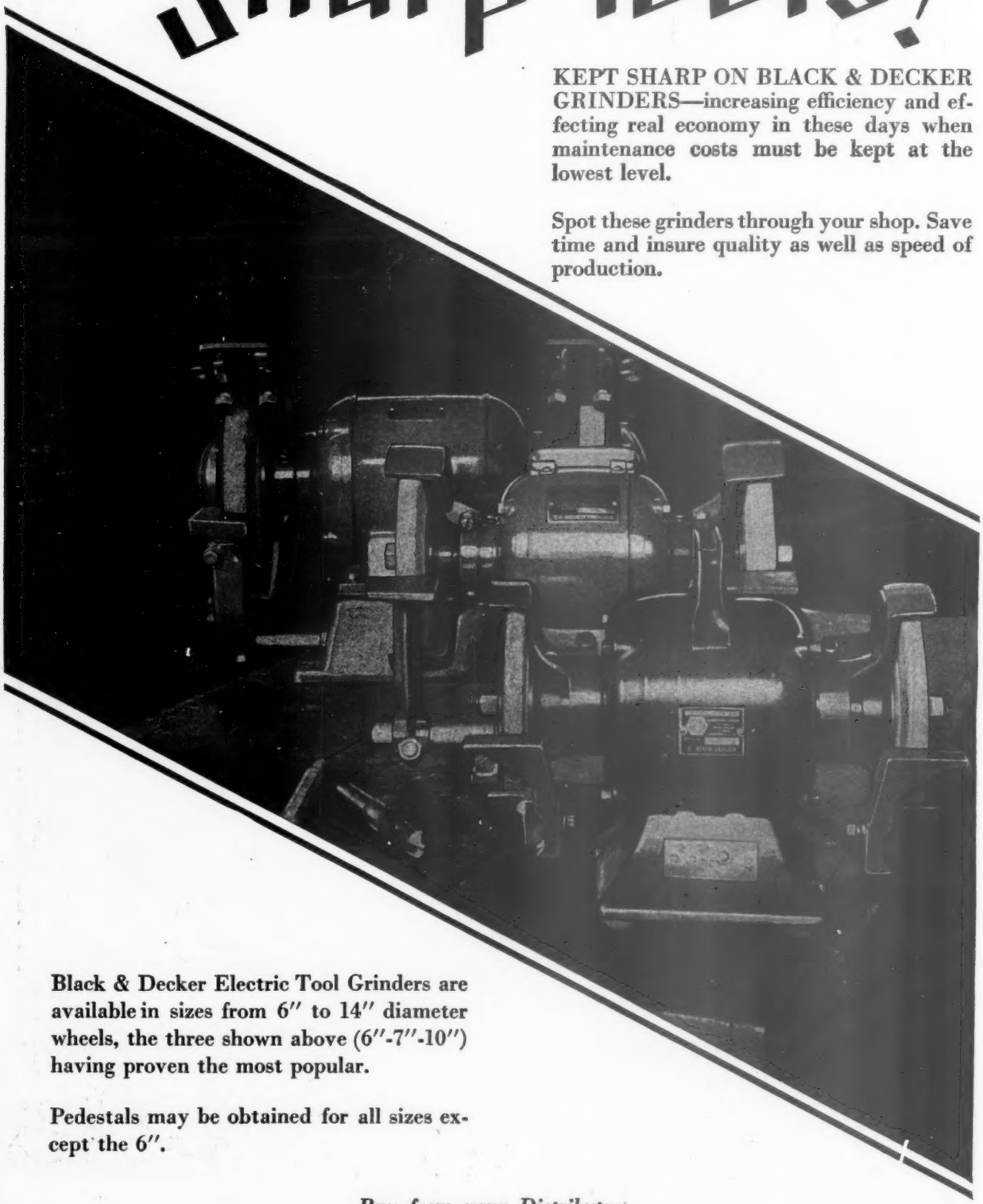
LONG ISLAND CITY, NEW YORK, U. S. A.
TOLEDO, OHIO LA CROSSE, WIS.

Factories at Long Island City . Toledo . La Crosse . Canada . England
France . Germany . Australia

Sharp Tools!

KEPT SHARP ON BLACK & DECKER GRINDERS—increasing efficiency and effecting real economy in these days when maintenance costs must be kept at the lowest level.

Spot these grinders through your shop. Save time and insure quality as well as speed of production.



Black & Decker Electric Tool Grinders are available in sizes from 6″ to 14″ diameter wheels, the three shown above (6″-7″-10″) having proven the most popular.

Pedestals may be obtained for all sizes except the 6″.

Buy from your Distributor

The BLACK & DECKER MFG. CO.

TOWSON, MARYLAND

Sloughs, Bucks, England — Sydney, Australia — Toronto, Ont., Canada

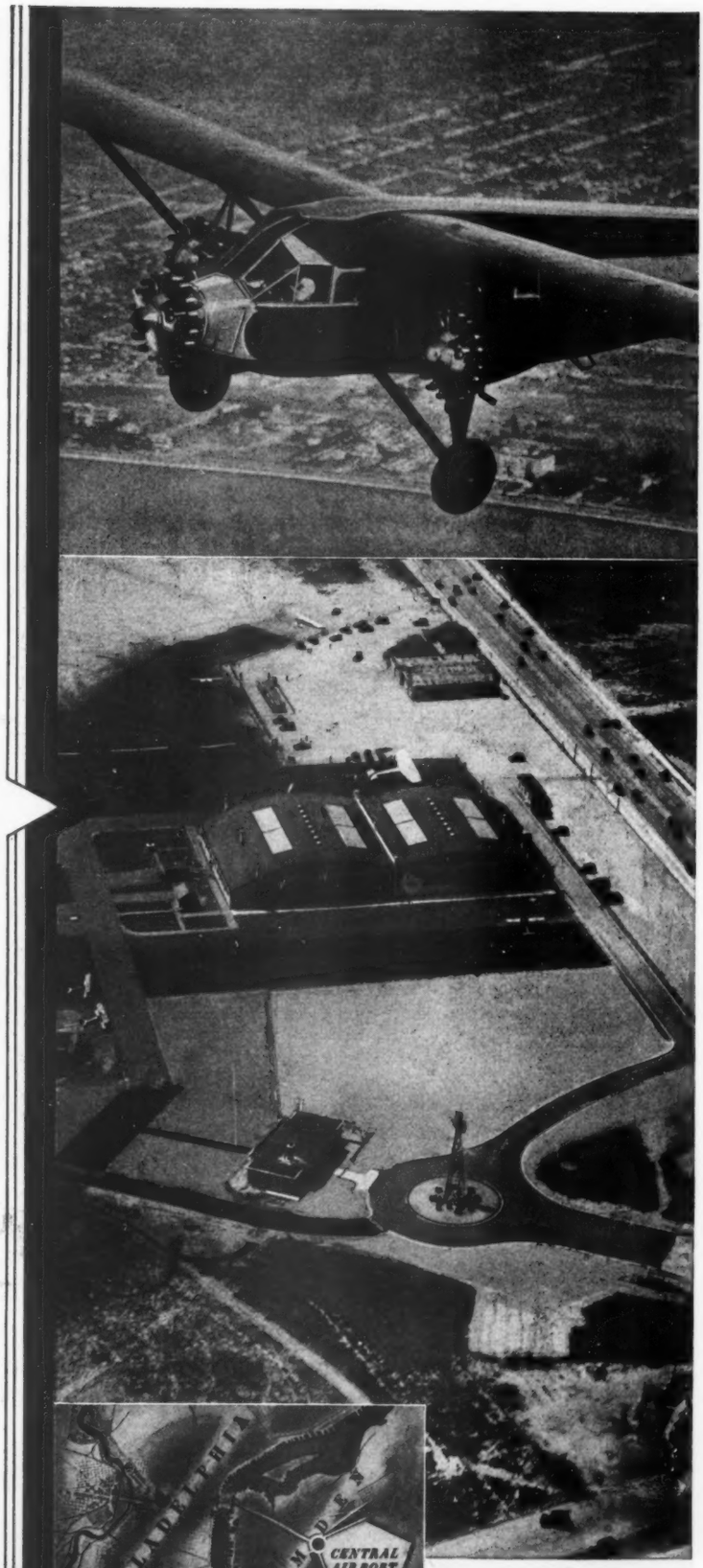
Every hour on the hour

fast tri-motored service between

NEW YORK
PHILADELPHIA
WASHINGTON

via

CENTRAL AIRPORT



City Hall, Philadelphia, is only 15 minutes away, by car or bus over a 10-lane highway and the Delaware River Bridge. The center of Camden, 6 minutes. Ocean shipping and main rail lines, 10 minutes. Here is the most accessible metropolitan airport in the world.

IN AUGUST, the New York, Philadelphia and Washington Airway Corporation inaugurates passenger and express service over one of the most populous and most traveled sections of the country. Central Airport was selected by the NYPWAC for the Philadelphia-Camden stop because of its excellent service and its closeness to the business centers of both cities.

Every hour on the hour, from 8 A. M. to 5 P. M., this service will leave the Pennsylvania Station in New York and the Union Station (and hotels) in Washington. Fares approximate railroad fares plus Pullman. Swift, comfortable 10-place, tri-motored Stinson planes will be used. Twenty times each day they will wing into Central Airport for Philadelphia-Camden passengers.

Business keeps looking up at Central Airport. It is the center of aviation activities in this section—equipped with every convenience for transport operators, private fliers and the public. Highly desirable land is still available for manufacturing and assembly purposes, for storage, display and office space. . . . For particulars write Central Airport, Inc., Camden, New Jersey.

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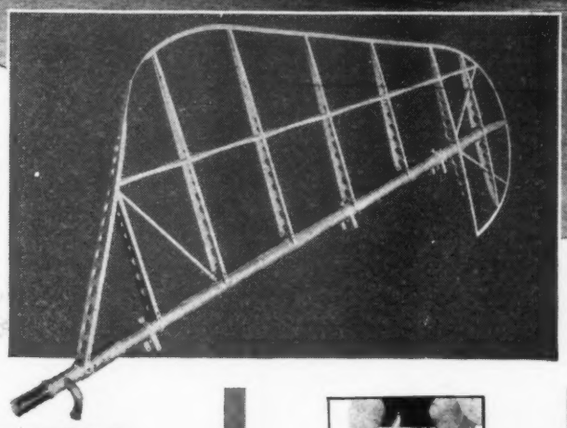
AIRPORT & AIRWAY
EQUIPMENT
WRITE for Illustrated Catalogue showing the latest ideas in Hangars, Buildings, Beacon Towers and other air-field equipment.
THE INTERNATIONAL DERRICK & EQUIPMENT COMPANY
COLUMBUS, OHIO. BEAUMONT, TEXAS. LOS ANGELES, CALIF.
U.S.A.

Model C4-225 Spartan Monoplane which has been so well received at recent Aircraft Shows.



For attaching elevator ribs to the spar–

SPARTAN AIRCRAFT

uses Self-tapping screws for ease, speed and economy in assembly

Spartan, like a score of other prominent aircraft manufacturers, finds Self-tapping Screws a real aid in saving assembly time and labor without sacrificing security.

One of the applications for which they use these unique Screws is illustrated here. Close inspection shows the Hardened Metallic Drive Screws used to attach the elevator ribs to the large duralumin tubular spar. Not only do these Screws hold better than machine screws under vibration, but they offer the greatest possible fastening ease and speed. It is only necessary that they be driven into holes drilled in the spar. They tap their own thread and hold the rib attachment fitting securely.

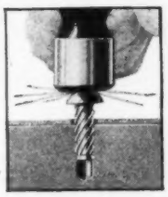
Spartan also uses another type of Self-tapping Screws, the Hardened Self-tapping Sheet Metal Screw, in the fabrication of oil and gas tanks. Worthwhile savings are also effected on this application.

Test these unique Screws for your assemblies. Judge their security....their time and labor saving ability for yourself. Just send a brief description of your assembly. We'll provide proper samples for a thorough trial.

Parker-Kalon Corp., Dept. M, 192-200 Varick St.,
NEW YORK, N. Y.

PARKER-KALON
HARDENED
Self-tapping Screws

PAT. IN U.S. AND FOREIGN COUNTRIES



HARDENED METALLIC DRIVE SCREWS

To make permanent fastenings to iron, brass and aluminum castings, steel, Bakelite, etc. Hammer the Hardened Metallic Drive Screw into a drilled or formed hole. The Screw forms a thread in the material, and makes a fastening that stays secure even under constant vibration and severe service.

HARDENED SELF-TAPPING SHEET METAL SCREWS

For making sheet metal assemblies. Turn the Hardened Self-tapping Sheet Metal Screw into a pierced or drilled hole. As the Screw is driven, it forms its own thread in the metal like a tap, drawing the sections securely together.

Bakelite Molded Case. Made by Consolidated Instrument Company of America, Inc., New York

"CONSOLIDATED" USES BAKELITE MOLDED

MAKING IMPROVED CASES FOR 50 PER CENT LESS

When the air speed indicator was housed in metal, electrolytic trouble developed frequently from contact between the mechanism and the metal case. To overcome this fault through providing an indicator housing of permanently dependable insulating material, this Consolidated instrument case is now made of Bakelite Molded.

The high dielectric strength of Bakelite Molded is supplemented by its strong resistance to corrosion. Bakelite Molded is non-hygroscopic and is unaffected by extremes of atmospheric temperature. Unlike metal, Bakelite Molded will not stain, rust or tarnish, and the indicator case comes from the mold **with a** lasting finish — dull black on the rim and flange, **and** lustrous black on the body.

Molded in one piece, each case is fitted with two threaded bronze bushings which are firmly embedded at the time of molding. Seven screw holes are also formed and finishing operations eliminated. This simplified production through the use of Bakelite Molded effected a 50 per cent saving in cost.

Manufacturers are invited to enlist the cooperation of Bakelite Engineering Service. Write for Booklet 59-M, "Bakelite Molded."

BAKELITE CORPORATION, 247 Park Avenue, New York. CHICAGO OFFICE, 635 West Twenty-second Street

BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario

BAKELITE

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"The registered Trade Mark and Symbol shown may be used only on products made from materials manufactured by Bakelite Corporation. Under the copyrights "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products."

THE MATERIAL OF A THOUSAND USES

"WHAT DO YOU MEAN, DRAIN IT?... THAT'S QUAKER STATE!"

WHEN ordinary oil has taken the count, Quaker State is still hale, hearty and ready for more pummeling...ready and able to give that sweeter, smoother lubrication a motor needs.

And why can Quaker State "take it" longer than ordinary oils and then come back for more? Because there's an extra quart in every gallon of it.

Quaker State is not refined like ordinary oils. It is *super-refined.* This Quaker State *super-refining* process carries it a step further and removes the quart of waste material that ordinary refining leaves in every gallon of oil.

In place of this quart of waste you get a quart of the finest lubricant—four full quarts of lubricant to every gallon of Quaker State. So you really get an *extra* quart.

And there's another reason why Quaker State Aero Oil is a better oil for any plane. It is made from 100% pure Pennsylvania Grade Crude Oil—the very finest crude oil the world produces.

Get Quaker State Aero Oil at your airport—and you'll get the finest oil that ever ambled aloft. You'll get an oil that holds its body—an oil that stands up under engine heat like no other oil you've seen. You'll get the smoothest, sweetest lubrication a motor ever had!

Other Pure Pennsylvania Products are:

QUAKER STATE MEDIUM MOTOR OIL
QUAKER STATE MEDIUM HEAVY MOTOR OIL
QUAKER STATE HEAVY MOTOR OIL
QUAKER STATE COLD TEST
QUAKER STATE TRACTOR OILS

QUAKER STATE OIL REFINING CO., OIL CITY, PA.

QUAKER STATE

TRADE MARK REG. U. S. PAT. OFF.

AERO OIL

Get that extra quart in every gallon

What do you need?

THE Searchlight Section of this publication serves as a handy and efficient means of getting in contact with others in the metal working industry who have services or material things to offer, that may just be one of your business wants. It is the industry's recognized center for the advertising of *all kinds* of business wants. Consult it regularly every week —use it for advertising the many miscellaneous needs that confront you from time to time. The cost of advertising is small, the results—usually prompt and profitable!

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PRODUCTS
TO MANUFACTURE
or
BRANCH PLANT
Etc., Etc.

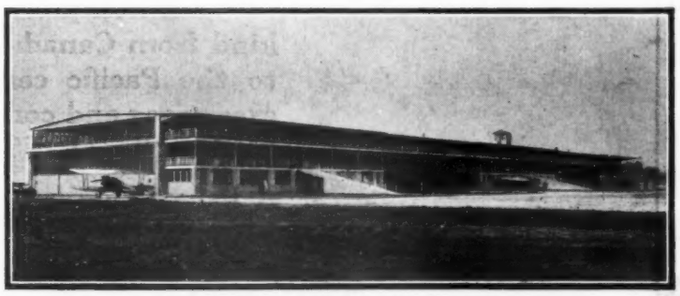
?

For Every Business Want–

Think "SEARCHLIGHT" *First*

FOR ONE PLANE OR A FLEET, STEEL HANGARS MEET THE NEEDS OF THE AVIATION INDUSTRY...

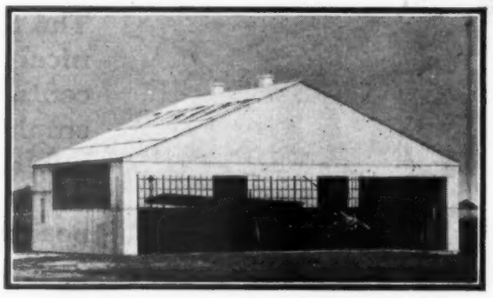
AVIATION is a growing, changing industry. The great planes of today, may be the pygmies of five years hence . . . Present airports may be abandoned or become of secondary importance as air travel increases.



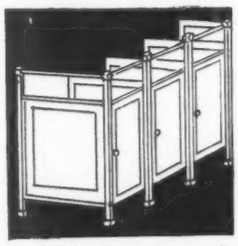
Curtiss Flying Service Hangar—Glenview, Illinois

For these reasons, steel hangars are the logical "buy" for the aviation industry. Not only are they inexpensive, sturdy, durable, speedily erected, and incombustible; but they can be enlarged to meet growing needs; moved to meet changing conditions, or taken down and sold with very little depreciation.

How universal is the satisfaction which steel hangars are giving may be judged from the fact that there are probably more planes housed in hangars of steel today than in those of any other type.

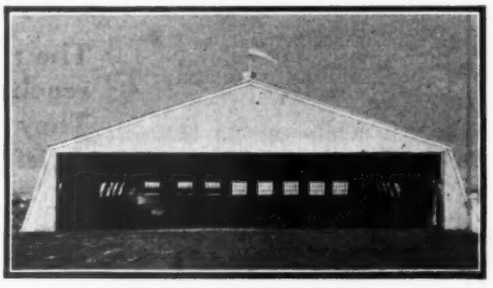


Board of Commerce, City of Lansing Municipal Airport, Lansing, Michigan



Steel Toilet Partitions are absolutely sanitary, neat, permanent. They save money and speed up construction.

For complete information on steel hangars for one plane or a fleet, write Trade Research Division, National Association of Flat Rolled Steel Manufacturers, 511 Terminal Tower Building, Cleveland, Ohio.



Steel Hangar, Champaign, Illinois

Save Time Labor Money with Steel Hangars

Locating Competent Help for the Nation's Biggest Industrial Concerns

THE man who reads the leading business paper of his industry ought to be the best man for a business position. That's why concerns of every kind from Canada to Mexico and from the Atlantic to the Pacific center their employment wants for executives and competent assistants in the SEARCHLIGHT SECTIONS of the McGraw-Hill publications.

A list of the companies that have used "SEARCHLIGHT" for this purpose within the last year would read like a directory of prominent concerns in almost every branch of industry.

The SEARCHLIGHT SECTIONS are known to technical men the world over as the "Opportunity" centers of fifteen important fields. They contain more employment ads for men in these fields than any other publications serving the same groups of readers—the natural attractions for those looking for better positions.

Each McGraw-Hill publication is the leader in its field and "SEARCHLIGHT" is used and consulted for every business want of their respective readers.

The men YOU need—now or in the future—can be reached through "SEARCHLIGHT" ads. Use them. They cost little and returns are invariably prompt and satisfactory.

Write today to:

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McGraw-Hill Publishing Co.

10th Avenue at 36th Street

New York City

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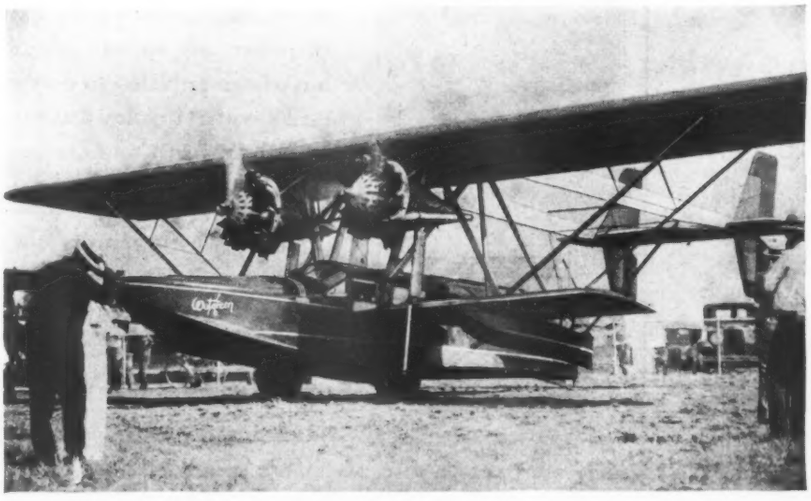
... they reward Courteous Service with LUXURIOUS FLYING



Executives of the Walgreen Drug Stores use the Company's Sikorsky Amphibion to save valuable travel time when visiting branches, and particularly efficient salespeople in the Company's employ are rewarded with flights in the ship

Mr. C. R. Walgreen, executive head of the Walgreen Drug Stores

WHENEVER a great business spreads from city to city, and from state to state, its growth brings with it the problems of supervision. And that means travel time. In the management of the Walgreen Drug Stores the Company's Sikorsky Amphibion plays a vital and time saving part.

Not so long ago it became necessary for Mr. Walgreen and three of his department heads to visit several branches. Leaving the home office in Chicago they flew to Denver and back in four days, stopping at Des Moines, Omaha, Lincoln, Wichita and Kansas City. Their Sikorsky provides fast, luxurious transportation.

Tactful and efficient salespeople in the Walgreen Company have also learned to know and enjoy the big Amphibion. When shoppers report an employee as being particularly courteous, the good work is rewarded with a ride in the "S-38."

This Sikorsky Amphibion is unusually well adapted to the use of large business organizations. The ship is powered with two 420 H. P. "Wasp" engines, which give her a cruising speed of 110 miles an hour. And so large is her reserve of power that she can fly and maneuver on either engine. Further, it requires but a few seconds to convert the ship from seaplane to landplane. She takes off and alights on land or water with equal facility. Many cities have fine water fronts almost within a stone's throw of their business centers.

There's a booklet which tells more about these advantages of the Sikorsky Amphibion. May we send you a copy? Sikorsky Aviation Corporation, Bridgeport, Connecticut. Division of United Aircraft & Transport Corporation.

From the window of the comfortable and speedy Sikorsky Amphibion the Chicago lakefront looks like this. Note the nearness of water landing places to the center of town. Photograph from Fairchild Aerial Surveys

SIKORSKY AMPHIBION

23 INSTRUCTORS

$100,000 worth of TRAINING PLANES

The Boeing School of Aeronautics is recognized as the nation's best-equipped flying school—and one of the largest.

Its complete flying and mechanical training is based on the 10,000,000 miles flown by Boeing planes over the nation's two longest air routes. And backed by the nation-wide resources of the United Aircraft & Transport Corporation.

Each of the 23 instructors was chosen for his special qualifications for ground school or flying instruction. The five flying instructors, for example, have an average record of 4,000 hours night and day flying—with the air mail and in army flying instruction, forest patrol and commercial flying.

Every Boeing flying student must master each of the various types of planes—first mechanically, then as a pilot. He must learn to fly by instruments, and at night, to take off and land under adverse conditions, to meet all flying emergencies. In short, to be a pilot, not just a flyer. The mechanical courses offer the same superior training.

The Boeing School offers the kind of training more and more employers are demanding. The coupon below will bring you the facts.

ENROLL NOW

BOEING
SCHOOL OF AERONAUTICS

Division of United Aircraft & Transport Corporation

BOEING SCHOOL OF AERONAUTICS AV-7530
Airport, Oakland, California
Gentlemen: I am interested in

☐ Private Pilot
☐ Limited Commercial Pilot
☐ Transport Pilot
☐ Boeing Master Pilot
☐ Airplane Mechanic
☐ Engine Mechanic
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Revolutionizing The Performance of Aircraft Engines

THE stringent requirements of safety and dependability which aviation imposes on spark plugs have been fulfilled to a new and revolutionary degree by Champion's Aero A.

Built to give *better* and *safer performance* in the varied conditions to which an aviation spark plug is subject, fouling and preignition of the Aero A are practically impossible.

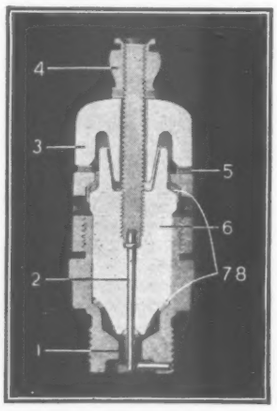
Sillimanite, the finest known insulator, is particularly adapted to aircraft spark plugs because of its remarkable strength. Moreover, the unique design used in the Aero A *positively prevents interference with engine operation*, in the remote possibility of breakage.

Aero A's are winning for themselves the same reputation for better performance and greater dependability in the air, that other Champions have enjoyed for years, the world over, on land and water.

Install Aero A spark plugs in your plane. The improvement they will bring you is unmistakable. They will render you *more* hours of dependable service.

Champion Aero A Exclusive Features

1. Restricted bore. 2. Special analysis electrode. 3. Secondary sillimanite dome insulator. 4. Welded steel terminal. 5. Copper seal. 6. Primary sillimanite insulator. 7-8. Molded copper gasket seals.

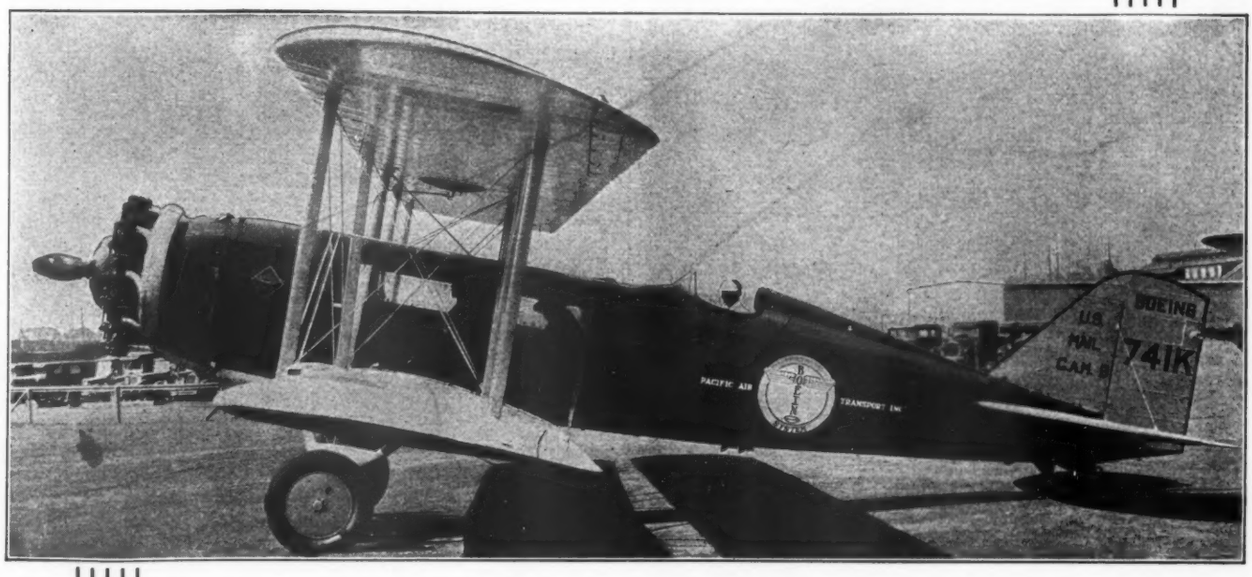


Concentration on this one type spark plug for practically all aircraft engines enables Champion, through large production, to offer this vastly superior spark plug at the extremely low price of $1.25.

CHAMPION
SPARK PLUGS

TOLEDO, OHIO WINDSOR, ONTARIO

...MORE BOEING 40-B4s now being built to meet continued demand!



The same high standards of material, manufacture and inspection that made the "Boeing Forty" outstanding in its field will be found in the latest Boeing 40-B4, mail four-passenger plane, being built for Fall delivery.

The Boeing Forties, some of which have already been flown more than 3000 hours, have a service record of more than 10,000,000 miles with seven air mail-passenger lines.

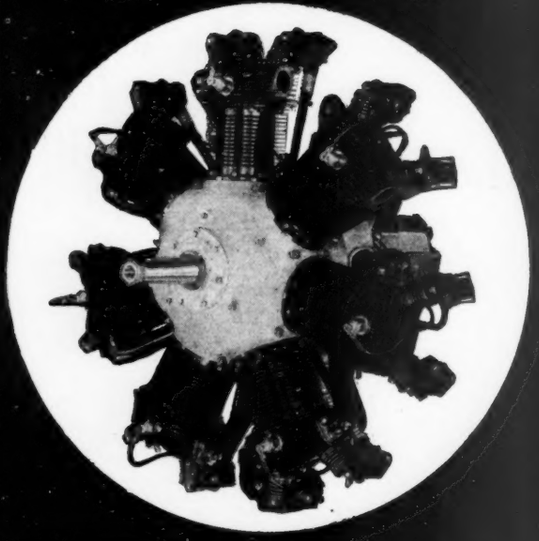
Ask for detailed performance records of these dependable, economical planes in the service of transport lines and other business firms.

BOEING
AIRPLANE COMPANY
SEATTLE, WASH.

A division of the United Aircraft and Transport Corporation

(In Canada: Boeing Aircraft of Canada, Ltd., Vancouver, B. C.)

PRECISION PARTS



The WARNER SCARAB *Engines*

MANY of the most precise parts of the famous Warner Engines are machined with exacting accuracy by Govro-Nelson.

The skilled engineers and accurate machines of the Govro-Nelson shop are producing varied aircraft engine parts with painstaking care and precision in both large and small quantities for many of the industry's leading engine builders.

GOVRO NELSON COMPANY
1931 ANTOINETTE-DETROIT

For more *Speed* and *Less Fuel*

Brace Aircraft with *Hartshorn* TIE RODS

The non-stretching, strong streamline tie rods perfected by Stewart Hartshorn Co. offer little wind resistance. That increases speed and reduces fuel consumption. They won't stretch! That cuts "follow up" and lining-up costs.

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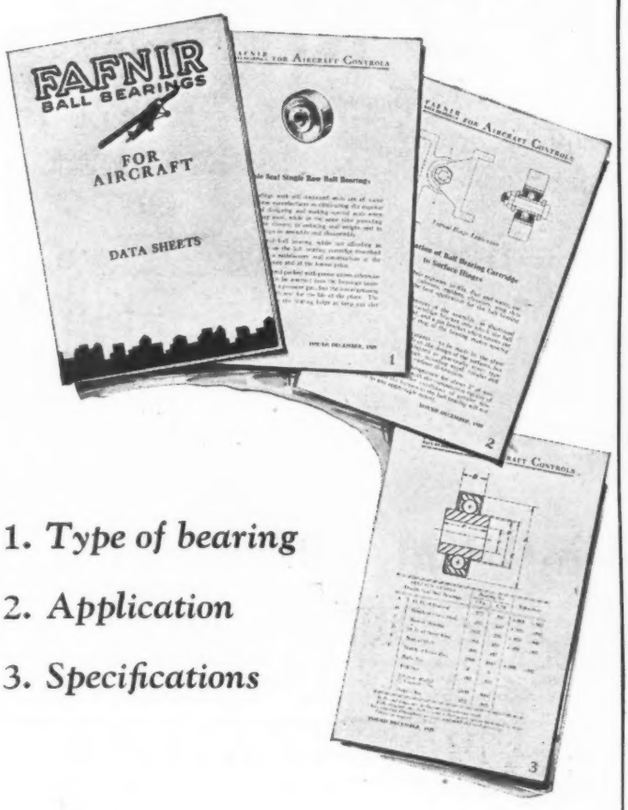

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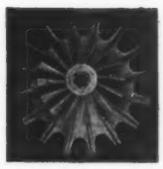

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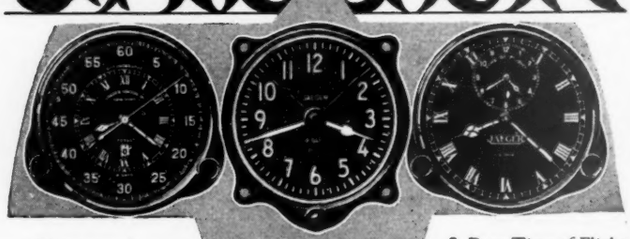

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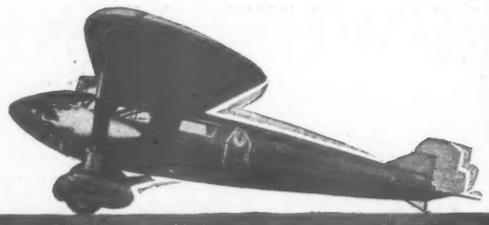

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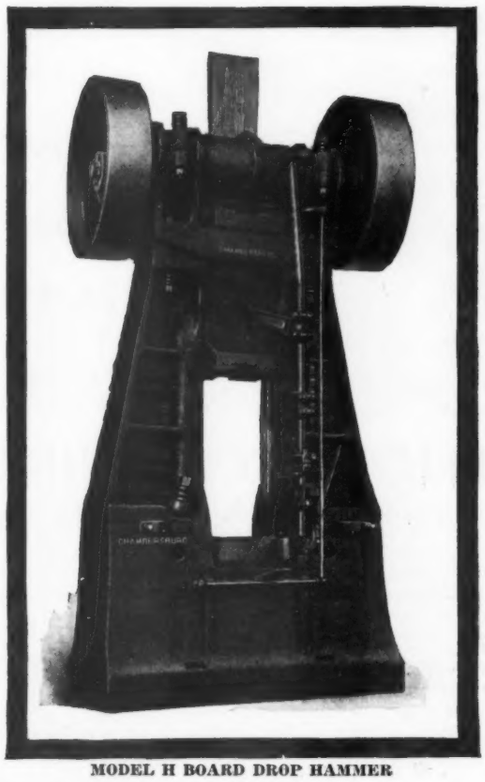

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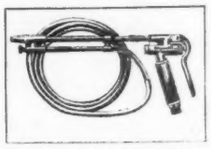
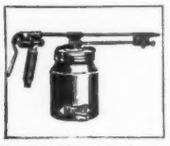


No. 78 Engine Cleaner

The illustrations to the right show two popular engine cleaning devices. Engine Cleaner No. 78 may be used for blowing and dusting as well as cleaning in the manner illustrated above. No. 79, designed for spray lubrication, can be effectively used as an engine cleaner. The cup holds one quart.



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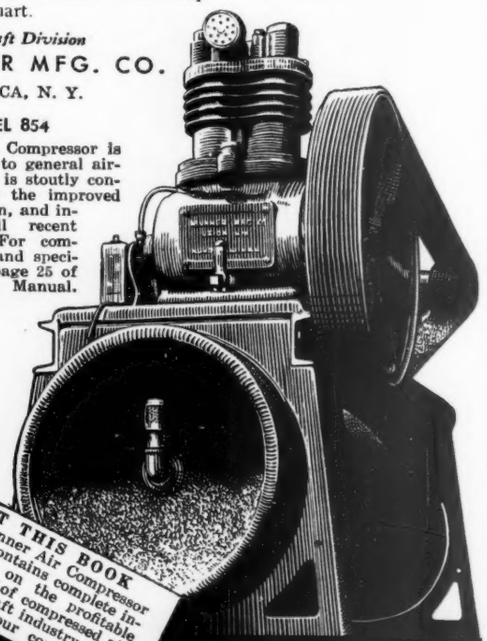

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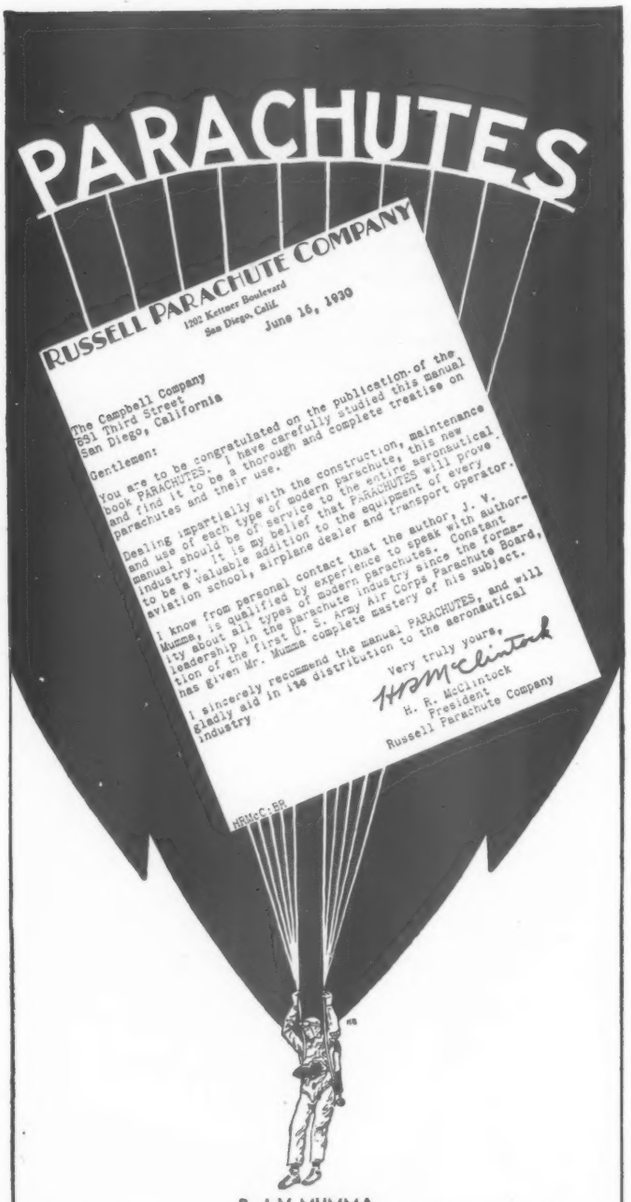
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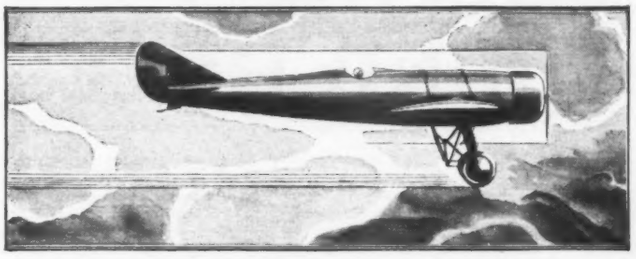

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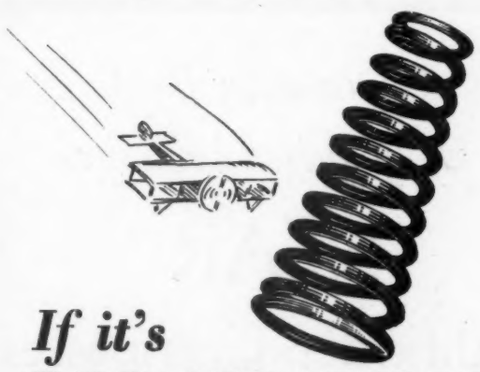

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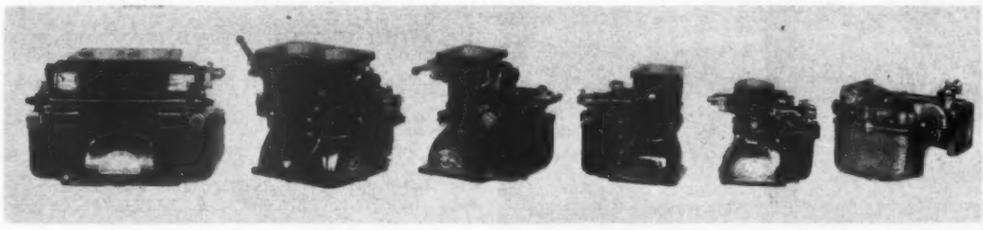

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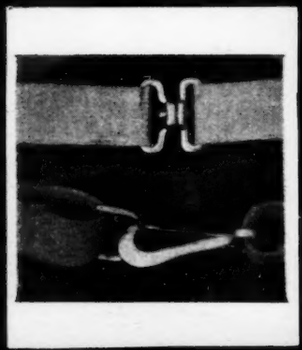

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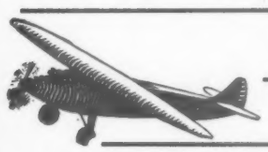

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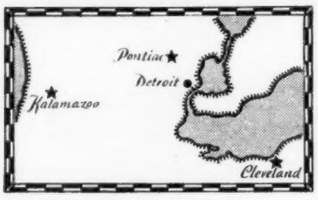

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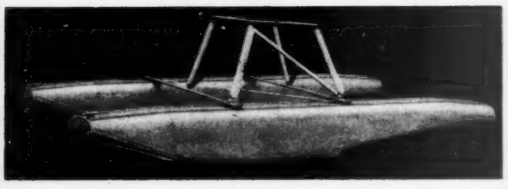

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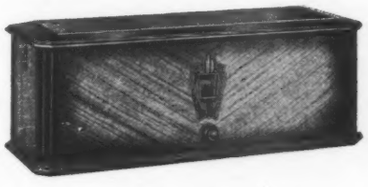

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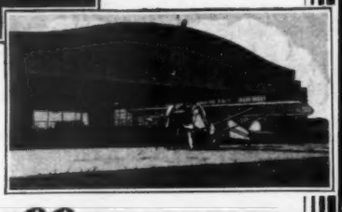

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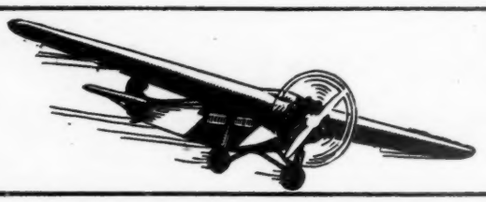

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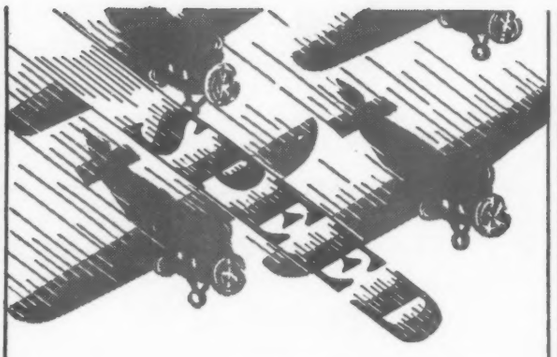

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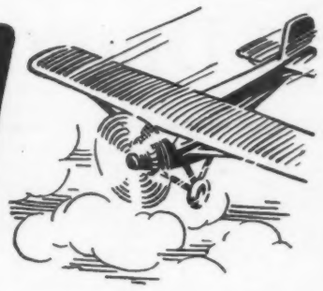

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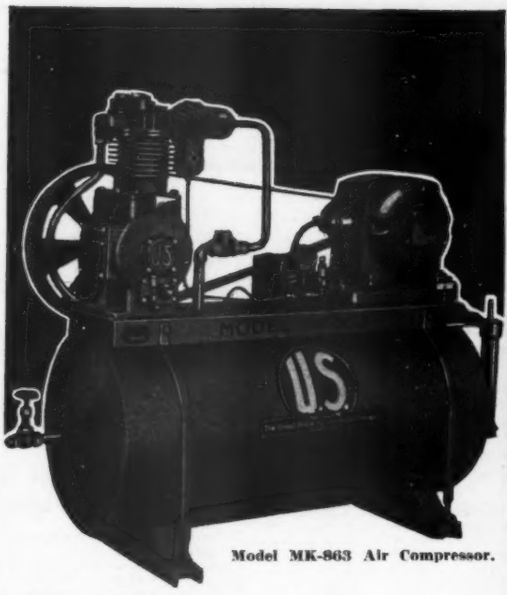

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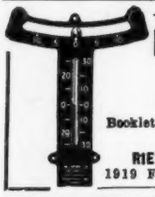

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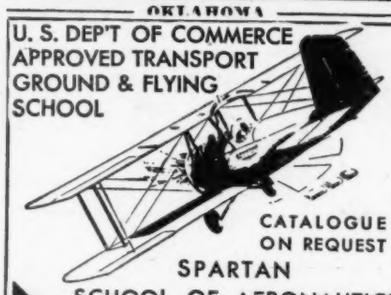

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FOR SALE

(Continued from preceding page)

FOR SALE: Waco 10, OX-5 motor, 225 hours. Excellent condition, recently completely overhauled. Always had considerate use. Complete insurance. Excellent for club use as it is owned by corporation which will go with it if desired. $1,200 for entire business. Charles L. Morris, 230 Prospect St., New Haven, Conn.

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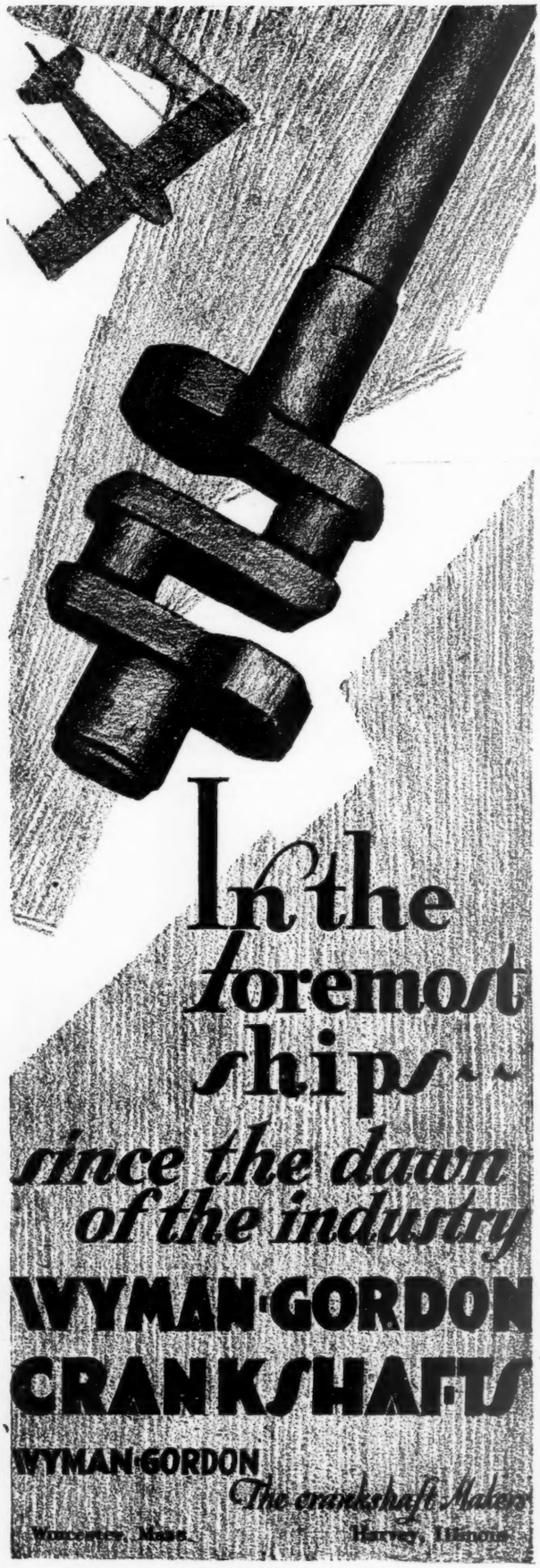

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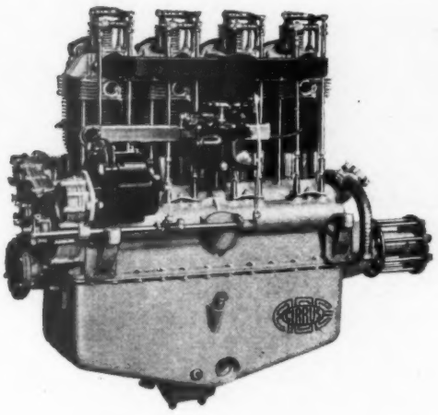

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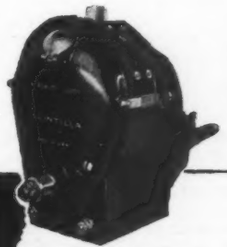

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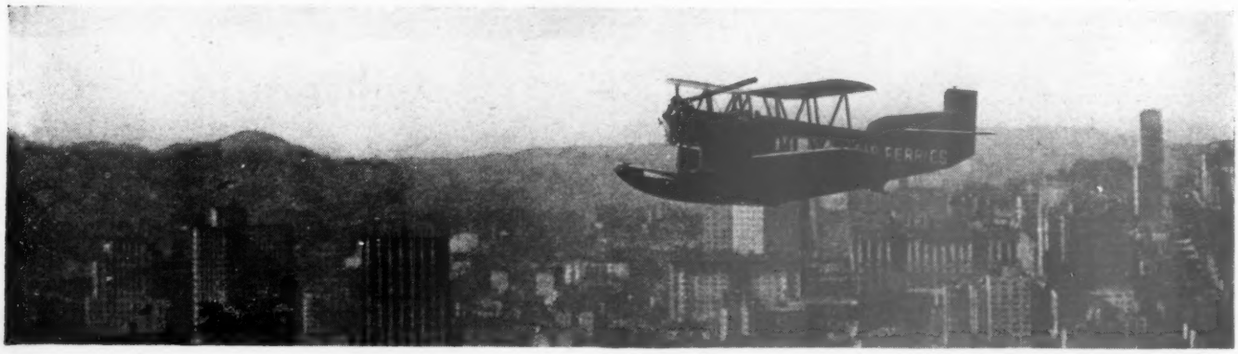

● *Air Ferries, Ltd., plane taking off for Oakland. San Francisco in background.*

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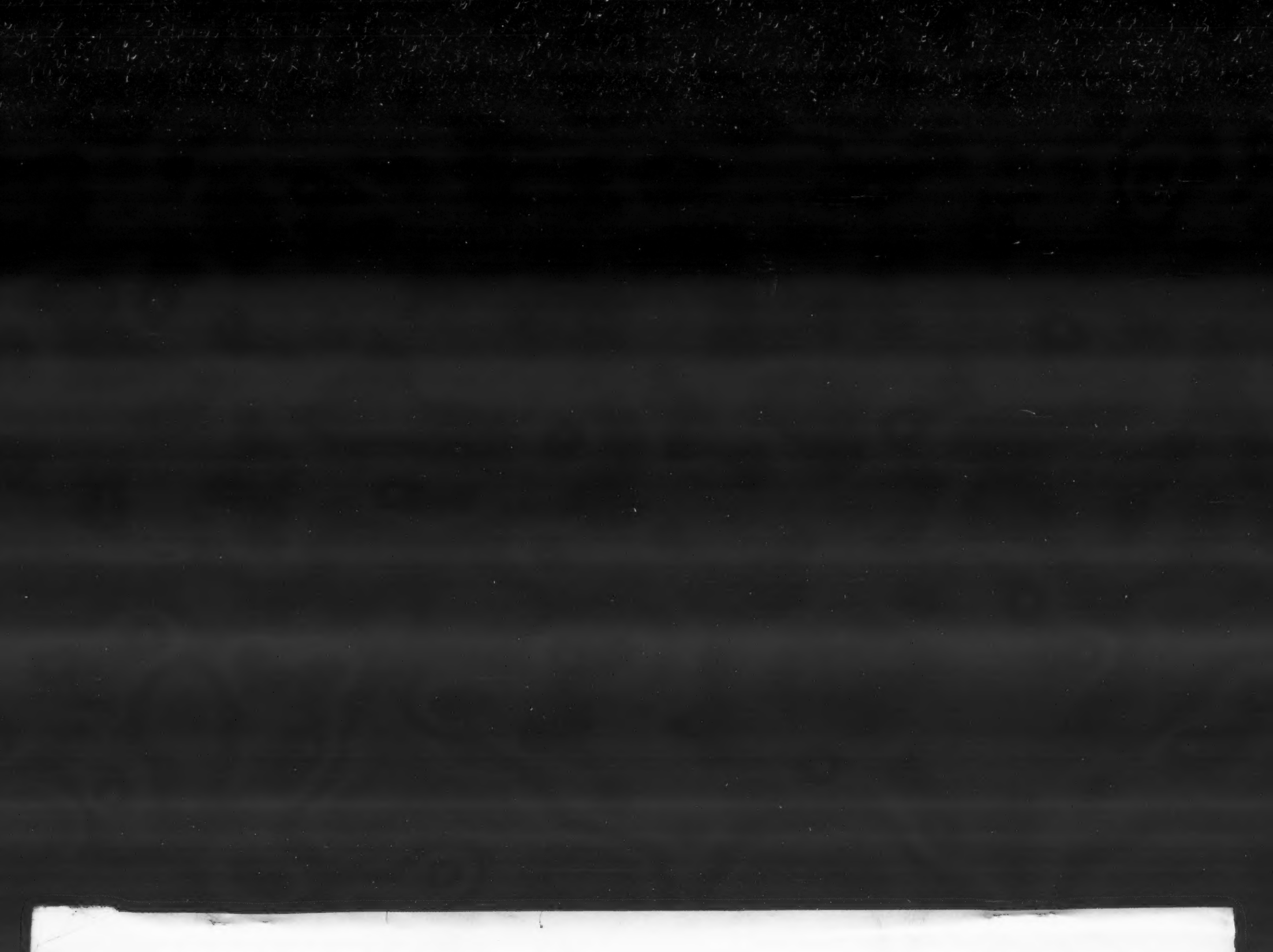
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